December 1949

WIRE AND WIRE PRODUCTS

Low Power Cost, Low Die Cost
Low Space Requirement High Production

MORGAN-CONNOR
WIRE MACHINE

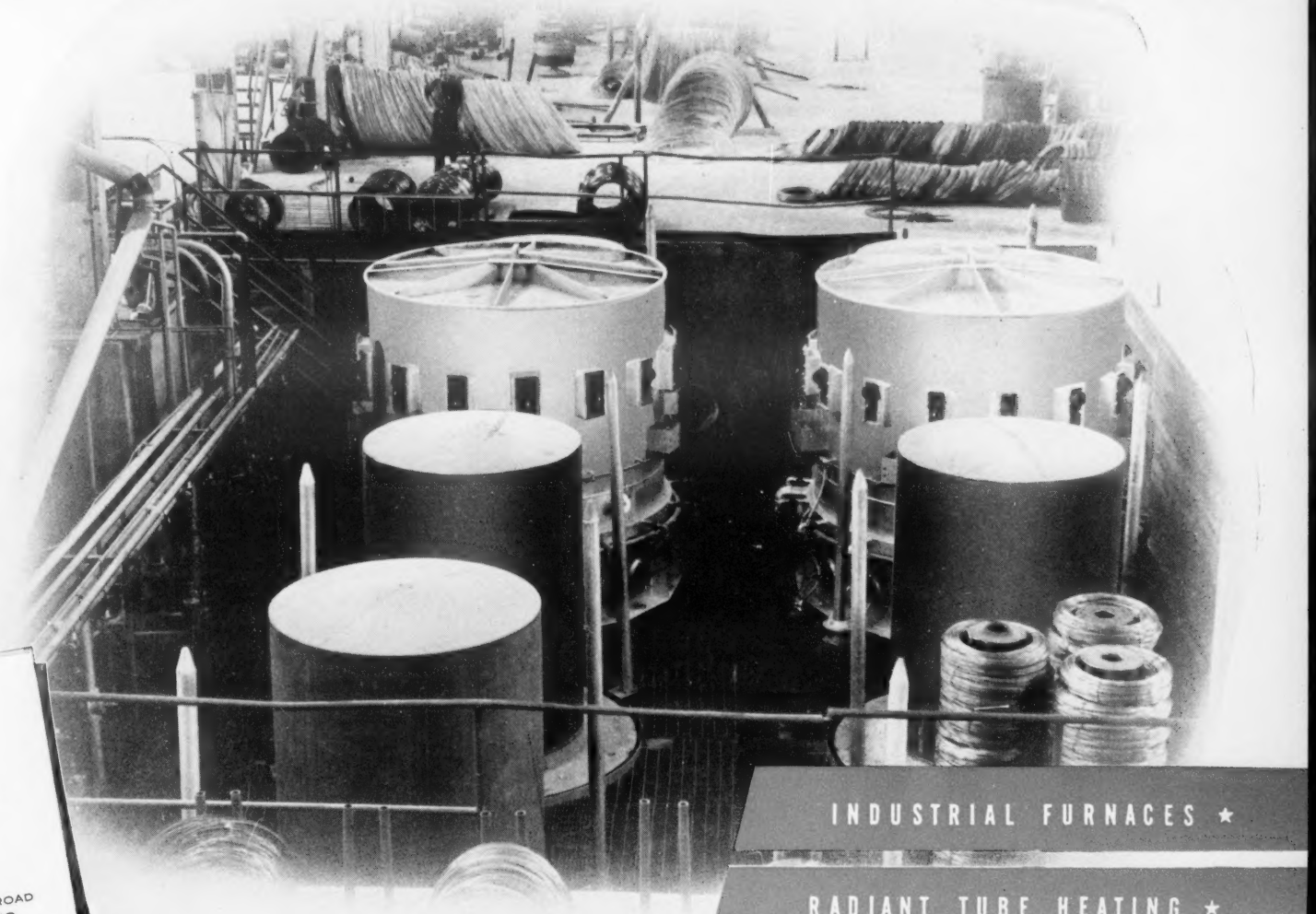
MORGAN CONSTRUCTION CO.
WORCESTER, MASS., U.S.A.

WM-32

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

WILSON WIRE ANNEALING *Furnaces*

LACLEDE Steel Company has rounded out its annealing facilities at the Alton, Ill. plant, with a second Wilson Annealing Unit. This installation now comprises two Furnaces and eight Bases — 62" dia. 84" high.



LEE WILSON ENGINEERING COMPANY, INC.
INDUSTRIAL FURNACES
RADIANT TUBE HEATING
HEAT TREATING PROCESSES

20005 WEST LAKE ROAD
CLEVELAND, OHIO
ACADEMY 4670

When this card is placed on your desk, a

INDUSTRIAL FURNACES ★
RADIANT TUBE HEATING ★
HEAT TREATING PROCESSES

HEAT TREATING PROCESSES

When this card is placed on your desk, a

What do CARBOLOY'S 29 quality tests mean to you?

HERE you see a drawing of a 16th-century water-powered wire-drawing apparatus.

Its production requirements were limited: a simple hole in a steel plate served well enough as a die.

But you, today, face intensive competition: your wire, bar, and tubing must be smooth, strong, and accurate. Your costs of die replacement and rejects must be kept down, too.

That's where Carboloy's exhaustive testing comes in—to assure you of dies that help keep the quality of your products *higher*, and your production costs and product prices *low*.

The photograph illustrates one of the 29 tests for quality that Carboloy is subjected to in every phase of manufacture—from powder to die.

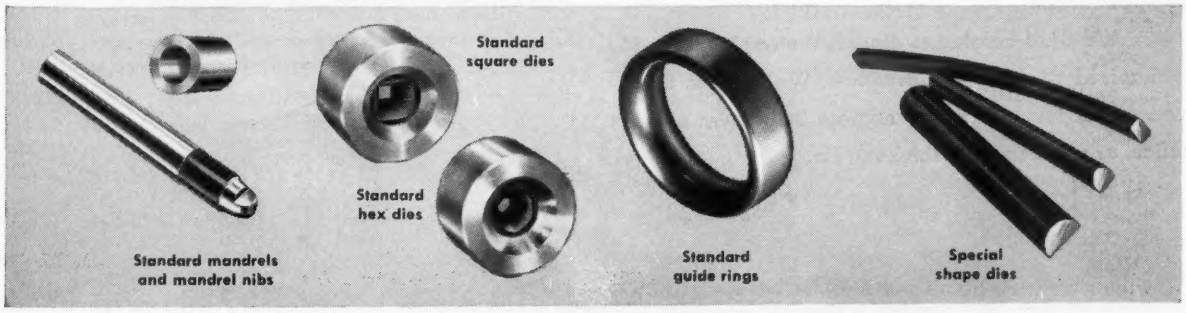
Spectrographic, microscopic, and chemical analyses; X-ray diffraction, transverse-rupture, and many other tests, ensure the high chemical purity of your Carboloy dies, and make certain that you get the best mechanical properties for your die needs.

Let us tell you more about these dies—and about Carboloy's extra benefits and assurances of quality. And ask for the Carboloy DIE SERVICE MANUAL D-119.

CARBOLOY COMPANY, INC.
11171 E. 8 MILE ST. - DETROIT 32, MICHIGAN

CARBOLOY®

CEMENTED CARBIDE DIES



Big Features of Bethanized Wire

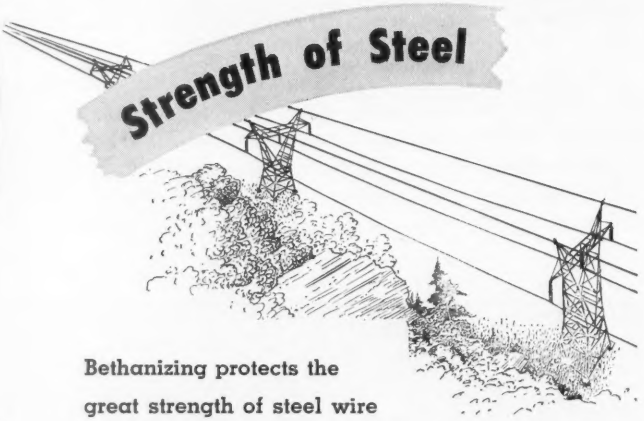
Extra Corrosion-Resistance

There are no thin spots in the tightly-bonded bethanized zinc armor to give corrosion a foothold. The coating is built up uniformly both around and along the wire by an electrolytic process.

Bethanized wire gives your products a smooth, lustrous appearance that increases their sales appeal. Whether you need hard- or soft-tempered wire, standard or heavy zinc coatings, you'll find this versatile steel wire readily adaptable to your requirements. It's been doing an outstanding job for 15 years, thoroughly proving itself in a wide variety of applications.

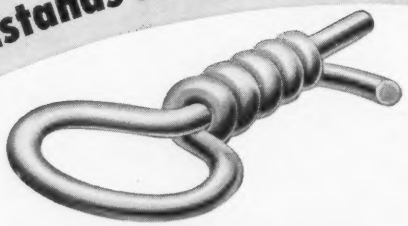
We shall be glad to discuss the application of Bethanized wire to your products. We suggest that you get in touch with the nearest Bethlehem sales office, or write us at Bethlehem, Pa.

Strength of Steel



Bethanizing protects the great strength of steel wire against corrosion. This is highly important for wire rope, strand, telephone wire and other wire products where high strength is vital.

Withstands Severe Forming



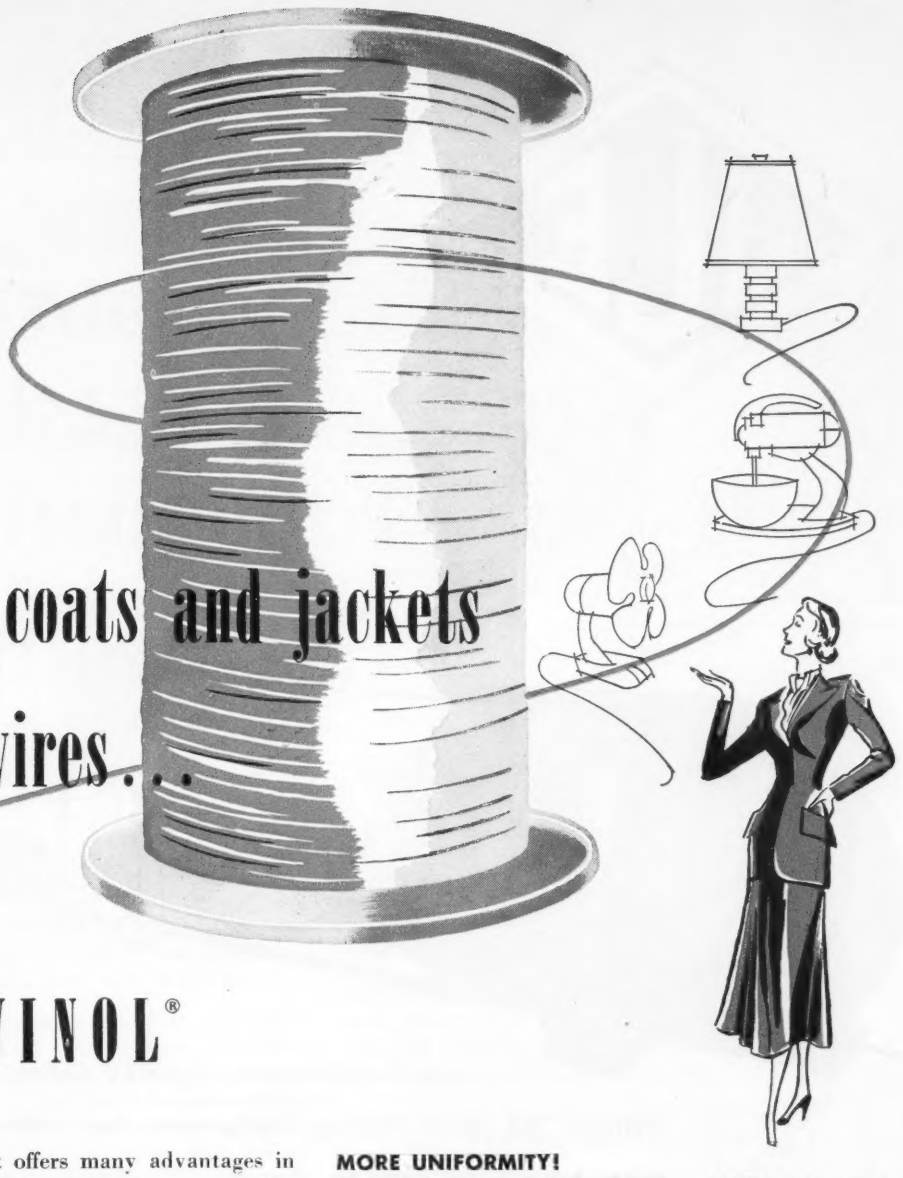
The zinc is 99.9 pct pure, and so ductile that it can be bent flat, twisted, and formed without danger of flaking the coating. The tight bond of zinc to steel permits even drawing through dies to fine gauge.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

WIRE & WIRE PRODUCTS, Vol. 23, No. 12, December, 1948. Publication Office, at One Sherman Ave., Jersey City 7, N. J. Executive Office, 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S. $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Re-entry as second class matter in Jersey City Post Office pending.



Better coats and jackets for live wires... with MARVINOL®

Here's a vinyl resin that offers many advantages in coats or jackets for wire. For example:

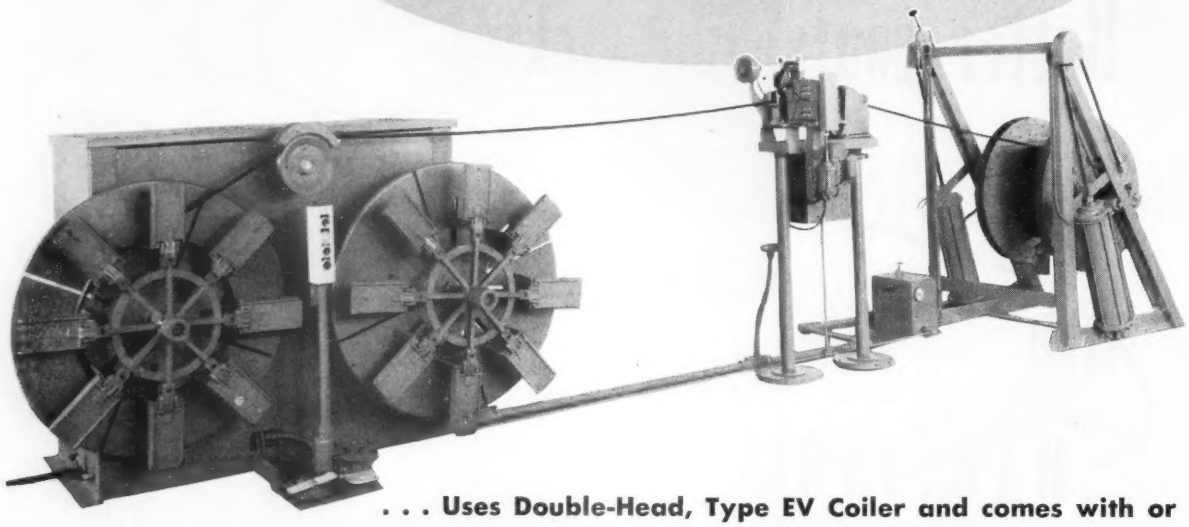
MORE STABILITY! Marvinol offers superior stability in processing and in end products. High molecular weight gives it extra toughness and "dryness" . . . yet it is easy to formulate by extruding, injection molding or other processes . . . is among the most versatile of vinyl resins. Wire covering made from Marvinol has greater resistance to heat and light, greater low temperature flexibility, may be brilliantly or delicately colored, has less heat deformation. Marvinol "coats and jackets" are also highly resistant to oils, acids, foods, aging, wear and other normally destructive factors.

MORE UNIFORMITY!
Marvinol resins are a development of Martin research and Martin's quarter-century of plastics experience. They're being produced in the world's most modern chemical plant to assure unexcelled uniformity. The Glenn L. Martin Company, maker of Marvinol, does not compound or fabricate in the plastics field. If you coat wire, our sales engineers and customer service laboratory offer full technical cooperation. If you buy or use finished wire, ask your supplier about Marvinol. Write on your company letterhead to: Chemicals Division, Dept. W-12, The Glenn L. Martin Company, Baltimore 3, Maryland.

Martin ® Marvinol

Resins, Plasticizers and Stabilizers Produced by the Chemicals Division of
THE GLENN L. MARTIN COMPANY—AN INTERNATIONAL INSTITUTION
"Better Products, Greater Progress, Are Made by Martin."

HEAVY-DUTY COILING & MEASURING EQUIPMENT



. . . Uses Double-Head, Type EV Coiler and comes with or without JLE Spark-Testing Equipment. For coiling heavy insulated wire, bare wire, rope or strand.

ANOTHER JLE CONTRIBUTION TO PROGRESS IN THE WIRE INDUSTRY!

Full details including quotations on request.

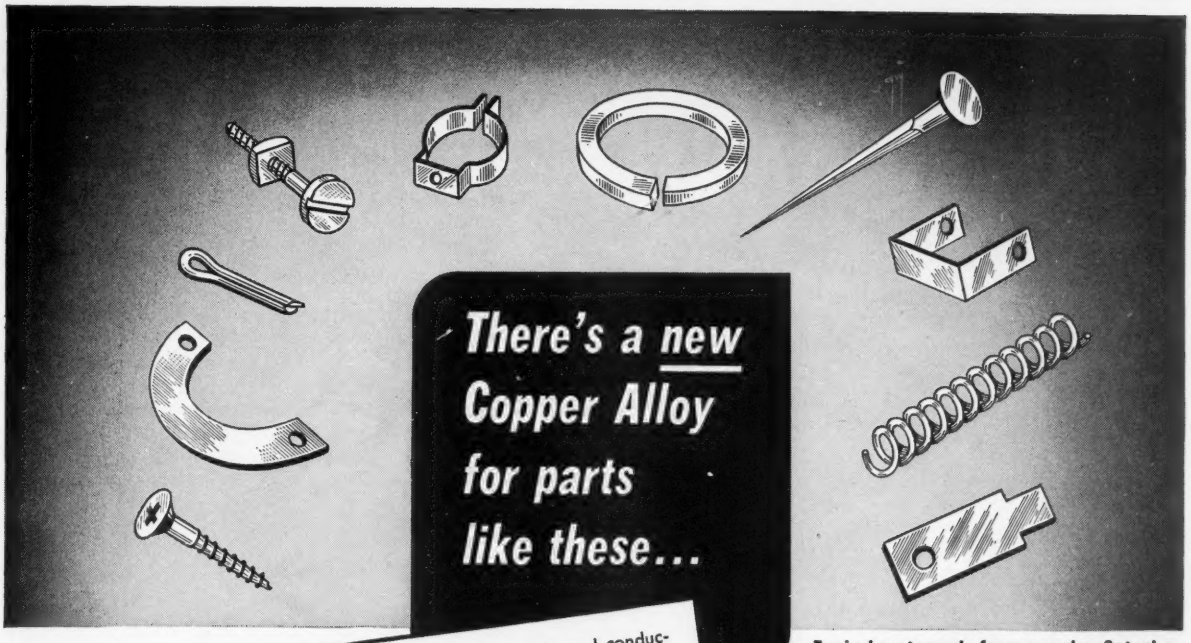
JAMES L. ENTWISTLE CO.

43 CHURCH STREET, PAWTUCKET, RHODE ISLAND

30 YEARS OF SERVICE TO THE WIRE INDUSTRY

Canadian Representatives:
THE A. R. WILLIAMS MACH. CO., LTD.
64 FRONT ST. W.
TORONTO, ONT.

British Associates:
GENERAL ENGINEERING CO., LTD.,
BURY ROAD, RADCLIFFE,
LANCS., ENGLAND



Typical parts made from round or flat wire

It combines tensile strength and conductivity to a unique degree... is unusually malleable... is resistant to stress corrosion and offers excellent resistance to creep at elevated temperatures.

CHASE patented PHOSNIC® BRONZE

HERE'S a radically different type of copper alloy that you'll want to investigate—PHOSNIC BRONZE, made *only* by Chase.

PHOSNIC BRONZE is exceptionally malleable, permitting severe cold heading even after hard drawing to attain high strength. In this condition its resistance to stress corrosion is outstanding. Special spring temper wire attains a tensile strength of 120,000 psi—yet even then has an electrical conductivity of 50% IACS with correspondingly high thermal conductivity. This combination of strength and conductivity, characteristic of Phosnic Bronze, is unmatched by any other commercial alloy.

PHOSNIC BRONZE is of particular interest where phosphor bronze, silicon bronze and cartridge brass have been used in the past. Phillips head screws, nuts, switch parts, fuse clips, lock washers, cotter pins, springs — these are just a few of the potential applications.

PHOSNIC BRONZE is supplied in the form of rod, round wire, rolled flat wire and tube—in tempers ranging from age-hardened condition up to and including special spring.

Mail the coupon for the full story of this remarkable new copper alloy.

Chase Brass & Copper Co., Dept. WWP128
Waterbury 91, Conn.

Gentlemen:
Please send me your free book, "Phosnic Bronze."

Name_____

Position_____ Company_____

Street Address_____

City_____ State_____

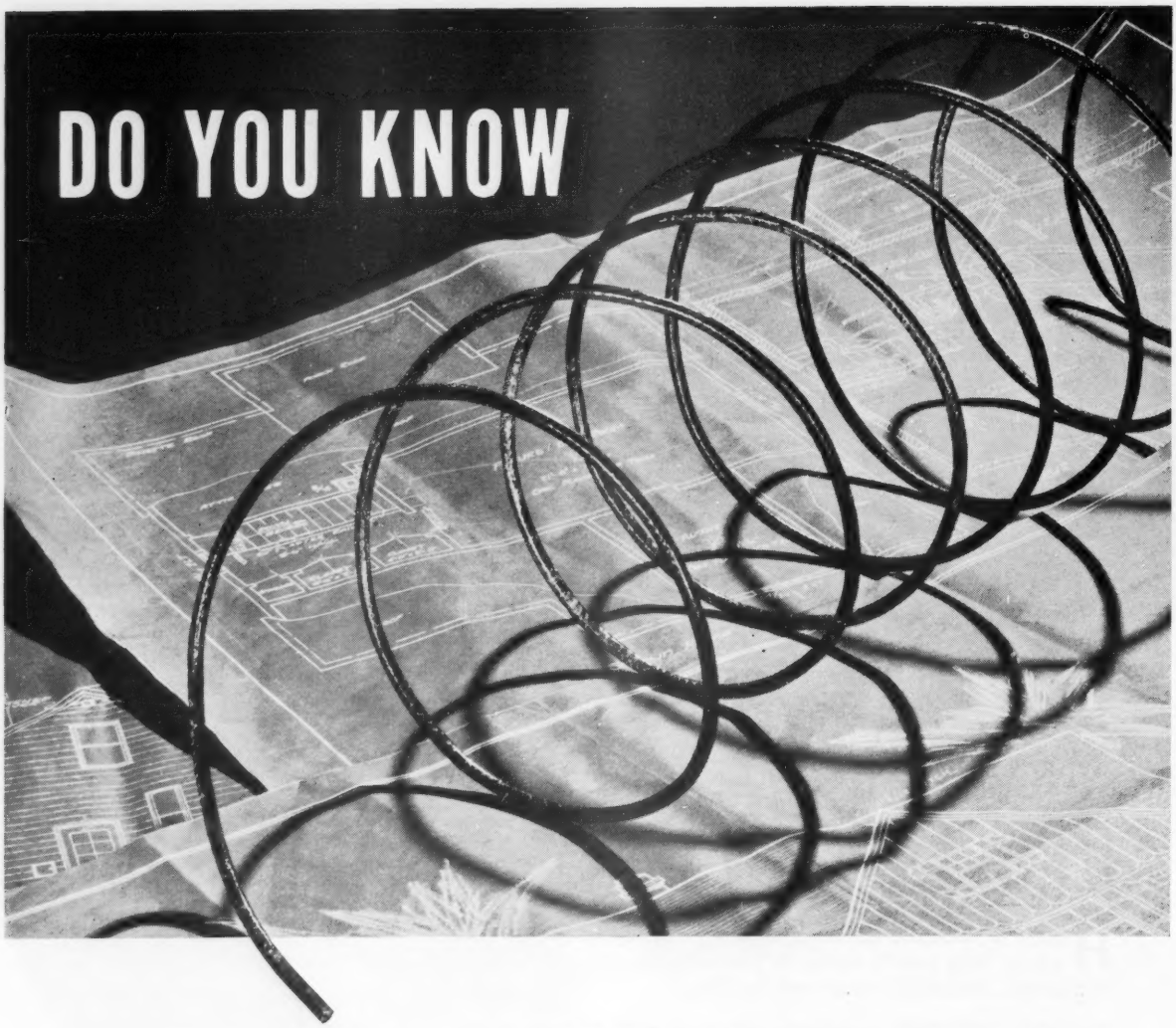
Chase

the Nation's Headquarters for
BRASS & COPPER

WATERBURY 91, CONNECTICUT — SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WATERBURY (†Indicates Sales Office Only)



...WHY FIBERGLAS* 150's YARNS ARE USED IN SINGLE CONDUCTOR BUILDING WIRE?

1. **Permanence.**
2. **Low Cost.**
3. **Good Yarn Application Efficiency.**
4. **Better Space Factor.**

For complete information about Fiberglas Yarns, for this and other electrical uses, write Owens-Corning Fiberglas Corporation, Dept. 875, Toledo 1, Ohio. Branches in principal cities.

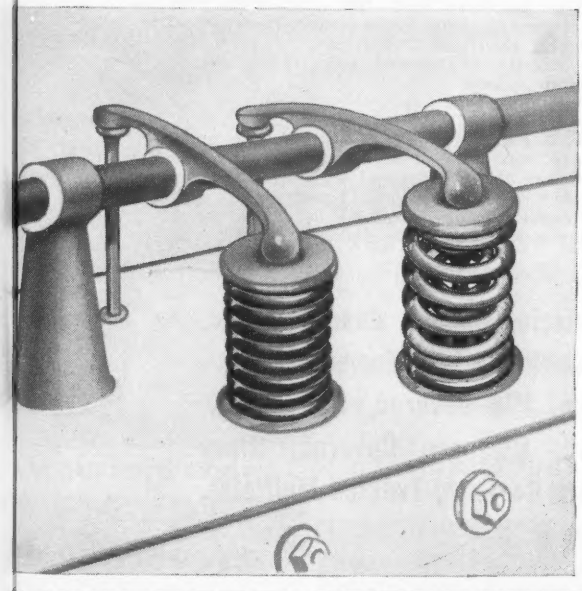
In Canada: Fiberglas Canada Ltd., Toronto, Ontario

OWENS-CORNING FIBERGLAS Yarns

TM. REG. U.S. PAT. OFF.

*FIBERGLAS is the trade-mark (Reg.U.S.Pat.Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

Confidence- WITH ITS SLEEVES ROLLED UP!



YEAR BY YEAR, planes grow bigger . . . faster and safer. Man has unbounded confidence in his ability to build better and better planes. Never satisfied, he experiments and tests tirelessly, and aviation progresses.

With similar vision and confidence, Roebling has been pacemaker in the development and manufacture of products essential to the transportation and other industries. The active, widespread confidence it has won among technical men and operators throughout industry is Roebling's proudest asset. Look to Roebling for continued leadership . . . continual improvement in its products and engineering . . . continual progress.

ROUND WIRE THAT'S "FOUR SQUARE" ON THE JOB

YOU GET WHAT YOU WANT with Roebling Round Wire . . . dimensional accuracy . . . the right tensile strength, ductility and finish . . . fewer rejects. The uniform quality of Roebling Round Wire enables you to maintain an exacting standard for your product.

Meeting stringent specifications is all in the day's work with Roebling. From steel mill to shipment, every manufacturing process is positively controlled. Roebling plants and equipment are up-to-the-minute and unsurpassed. Workmen are trained in special Roebling methods and techniques developed through experience in wire making that is without an equal.

Your Roebling Field Man may be able to show you new ways of stepping up production and cutting costs with Roebling Round Wire. Simply call your nearest Roebling branch office.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

A CENTURY OF CONFIDENCE ROEBLING

JAR ROEBLING

★ WIRE ROPE AND STRAND ★ FITTINGS ★ SLINGS ★ SUSPENSION BRIDGES AND CABLES ★ AIRCORD, AIRCORD TERMINALS AND AIR CONTROLS ★ AERIAL WIRE ROPE SYSTEMS ★ ELECTRICAL WIRE AND CABLE ★ SKI LIFTS ★ HARD, ANNEALED OR TEMPERED HIGH AND LOW CARBON FINE AND SPECIALTY WIRE, FLAT WIRE, COLD ROLLED STRIP AND COLD ROLLED SPRING STEEL ★ SCREEN, HARDWARE AND INDUSTRIAL WIRE CLOTH ★ LAWN MOWERS

Custom built spools for high speed winding

Mercury testing for continuity of film

Checking raw materials

Don't "fool around" . . . USE DEPENDABLE WIRE PRODUCTS!

A product, too, is only as strong as its weakest part. Follow the practice of leading designers and engineers by specifying only service-giving wire . . . wire that has built up a reputation for "delivering the goods under fire."

Hudson Wire products, designed for discriminating manufacturers, has just such a reputation in the fine wire field. Offering greater flexibility and tensile strength, perfect laying at higher speeds, new coating methods and reduced coil dimensions without sacrificing electrical values. Hudson Wire products will probably lower your production costs considerably. Check these three points:

QUALITY — All phases of manufacture, from ingot to final processing, are carefully supervised and fulfilled in the same manner you would carry out in your own plant. There are no unimportant phases in the work.

UNIFORMITY — By mercury process tests, our engineers can guarantee perfect uniformity in wire; from the smallest to the largest order. No more variations in consistency, structure or electrical properties . . . every inch of wire exactly as specified, more than meeting your requirements.

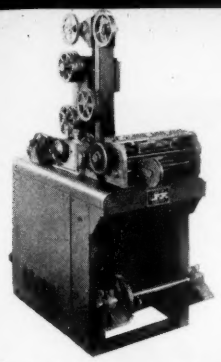
SERVICE — If you have a wire problem, our complete design and engineering facilities are at your disposal without obligation. Send your specifications and blueprints for our recommendations; or if you are not quite ready, write for samples of these quality products.

Enameled Copper, Enameled Iron, Enameled Alloy, Enameled Aluminum, Silk Covered, Cotton Covered, Celanese Covered, Glass Fibre Covered, Twisted Multiples, Parallel Multiples, and Litzendraht

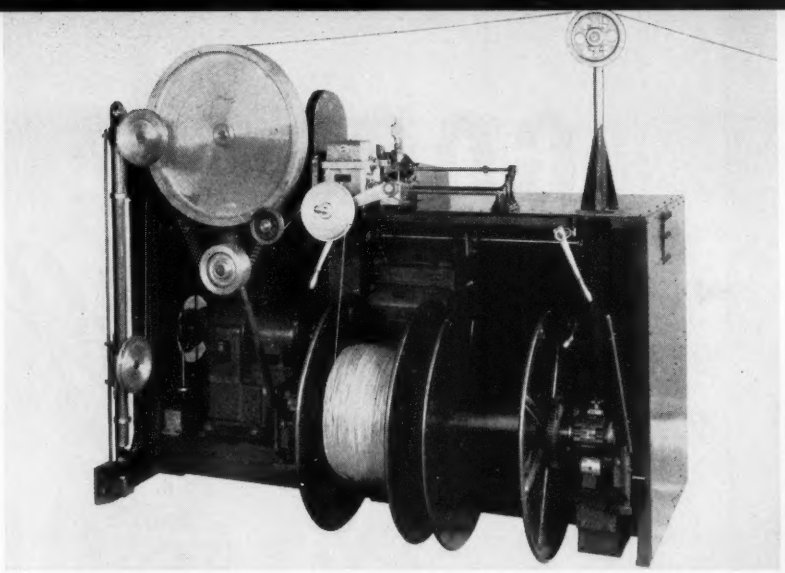
HUDSON WIRE CO.

Winsted Division

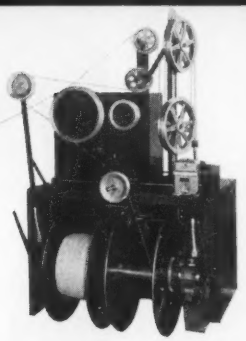
WINSTED CONNECTICUT



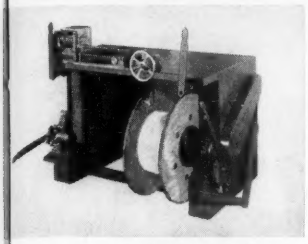
SINGLE REEL TAKEUPS



CONTINUOUS TAKEUP WITH INTEGRAL CAPSTAN

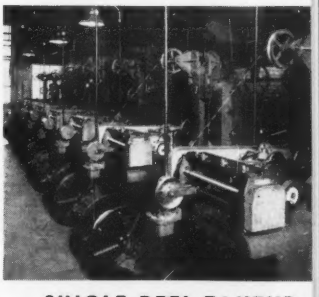


DUAL REEL TAKEUP



CONTINUOUS TAKEUP

INSULATED WIRE MACHINERY



SINGLE REEL TAKEUP

EXTRUSION SYSTEMS

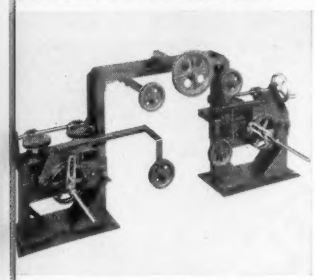
CONTINUOUS TAKEUPS — CORD PRE-DRYERS

LACQUERING SYSTEMS — ENAMELING MACHINES

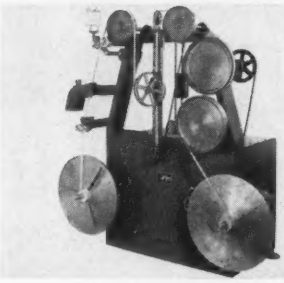
PROCESS ANNEALERS — DRAW BENCH TAKEUPS

ASBESTOS INSULATING MACHINES

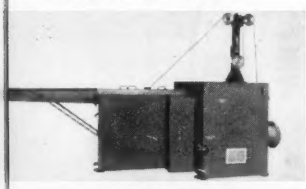
SATURATING AND FINISHING SYSTEMS



LETOFF STAND

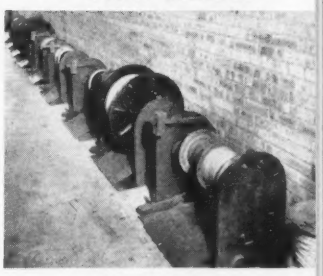


STRIP TAKEUP



TUBING TAKEUP

● IOI Equipment is used in the largest Wire Mills in the world. If you have a problem in this field it will pay you to consult IOI. Write for complete information.

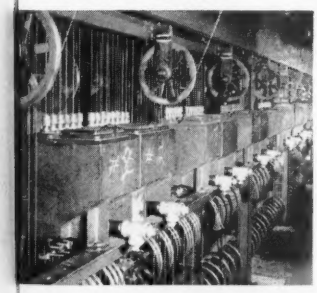


PAYOFF STANDS

INDUSTRIAL OVENS, INC.

13825 TRISKETT ROAD — CLEVELAND 11, OHIO

ASSOCIATED COMPANY• JAMES DAY MACHINERY LTD., LONDON, W. 1, ENGLAND

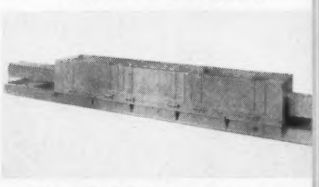


LACQUERING SYSTEM

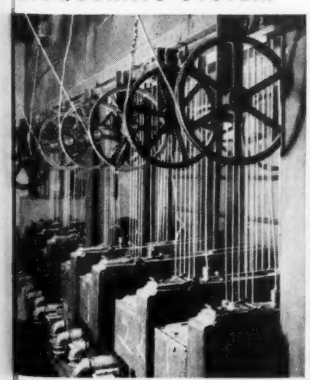
COOLING TROUGH

COOLING TROUGH

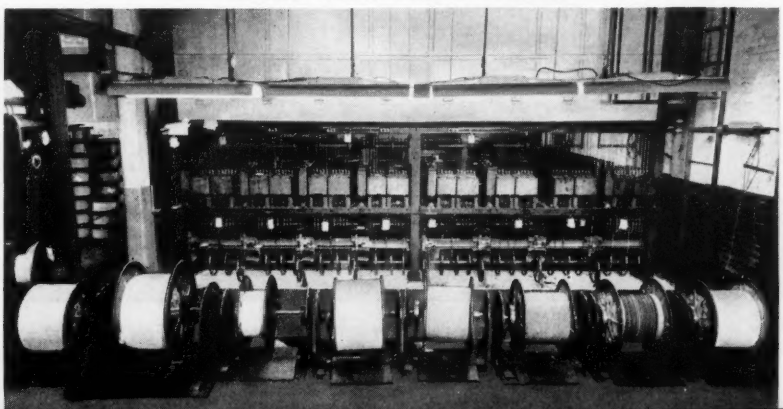
CABLE LACQUERING SYSTEM

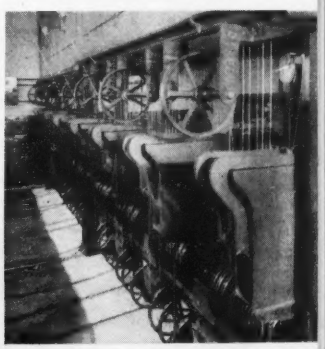


WIRE PRE-ANNEALER



LACQUERING SYSTEM





LACQUERING SYSTEM

GOOD... *through* THE CORE

CONTINENTAL STEEL CORP. · KOKOMO, IND. · COPPER NICKEL CHROMIUM METAL TRADE MARK KONIK REG. U.S. PAT. OFF.

● Many products made of wire can be built for longer life and improved, trouble free service if they are made from KONIK metal. KONIK, containing copper, nickel and chromium, offers manufacturers a stronger, tougher wire with *extra* resistance to rust and corrosion. These alloying elements added to Continental open hearth steel make KONIK higher in tensile strength . . . help make it a finer grained, tougher metal *all the way through*. Use KONIK wire to give your products that rugged resistance to wear and corrosion . . . to make them serve better and last longer. Wire or write Continental.

CONTINENTAL STEEL

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF *Manufacturer's Wire* in many sizes, finishes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

BLACK INDUSTRIES
CLEVELAND, OHIO

This Nameplate on Steel and Wire Mill Equipment is your assurance of fine design—conscientious workmanship—and *lower production costs.*

BLACK INDUSTRIES

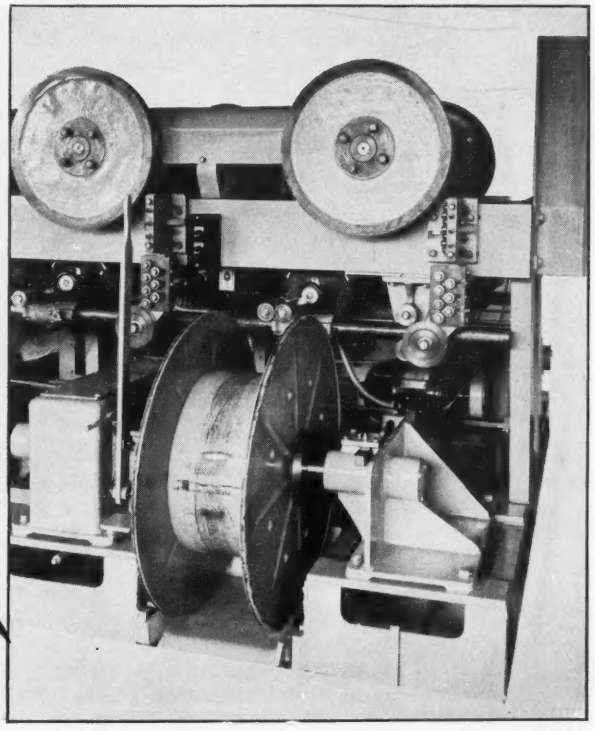
1400 EAST 222ND ST. • CLEVELAND 17, OHIO

Designers • Engineers • Builders of Steel and Wire Mill Equipment

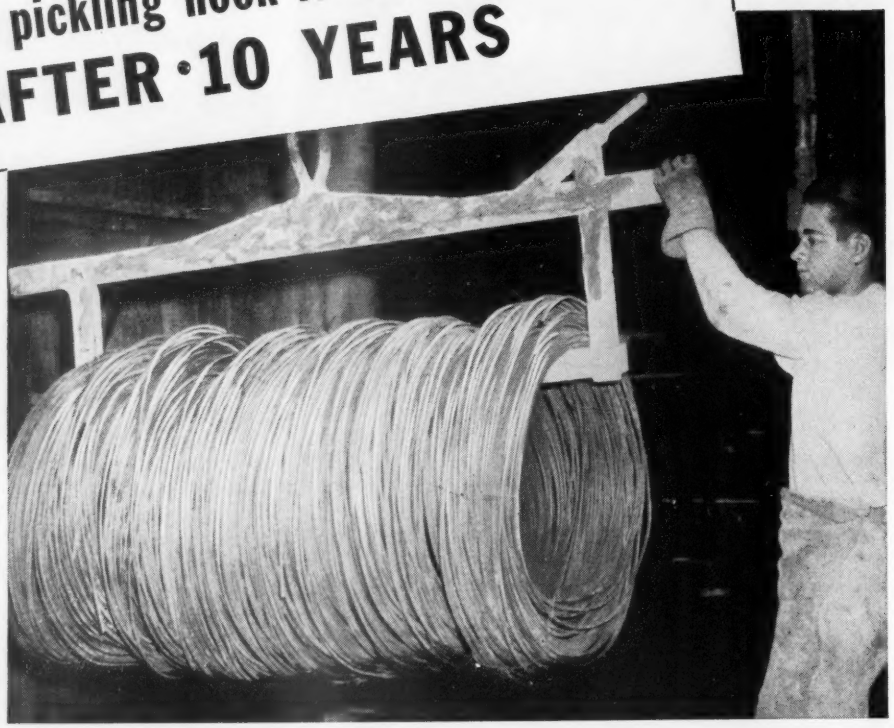
Single Unit of 36 Reel Wire Take-Up Frame

CONSTANT TENSION
NO SLIP CLUTCHES
NO RIDERS ON WIRE
SIMPLIFIED CONTROLS
ALL A. C. DRIVE

Designed and built by BLACK



Why this pickling hook is still in service AFTER 10 YEARS



These MONEL pickling hooks have handled coiled wire in pickling solutions—a ton at a time—for more than ten years, *and are still in service.* They are installed at the Birmingham mill of Lamson & Sessions.

More than a decade ago, Lamson & Sessions purchased MONEL* pickling hooks for service in their Birmingham, Alabama mill. The hooks were to be used in pickling coiled wire—a ton at a time.

Today, 10 years later, those same pickling hooks are still in service.

This is an outstanding service record—but users of MONEL pickling equipment know that it is not an unusual one. For MONEL is an alloy with a combination of properties that make it a *preferred* metal for pickling equipment.

★ ***High resistance to corrosion:*** **Hot pickling solutions have no appreciable effect on MONEL.**

★ ***High strength.*** **MONEL is stronger than structural steel. You can make your equipment *lighter* without sacrificing strength, which means increased pay loads.**

★ ***Hardness, toughness.*** **MONEL's resistance to abrasion cuts down on wear at critical friction points.**

★ ***Good Workability.*** **MONEL can be machined, formed, and welded, without special equipment. And what is extremely important in pickling applications, MONEL welds are *corrosion-resistant.***

★ ***Availability.*** **Your nearest INCO distributor stocks MONEL in standard mill forms such as sheet, bar, rod, wire, and tubing. MONEL screws, bolts, and rivets are also stocked in commonly-used sizes. If you prefer to have your pickling equipment made for you, many of the nation's leading fabricators are experts in handling INCO Nickel Alloys. A letter to INCO will bring you a list of these established fabricators.**

If you are contemplating new pickling equipment or planning to rebuild old installations, you will want to know more about MONEL. Our Technical Service Department will gladly make recommendations based on test data and the experience of other concerns. Why not write—today—and ask for your free copy of *Where Monel Pays Its Way in Pickling?*

*Reg. U. S. Pat. Off.

EMBLEM OF SERVICE

INCO TRADE MARK

MONEL FOR MINIMUM MAINTENANCE

THE INTERNATIONAL NICKEL COMPANY, INC.

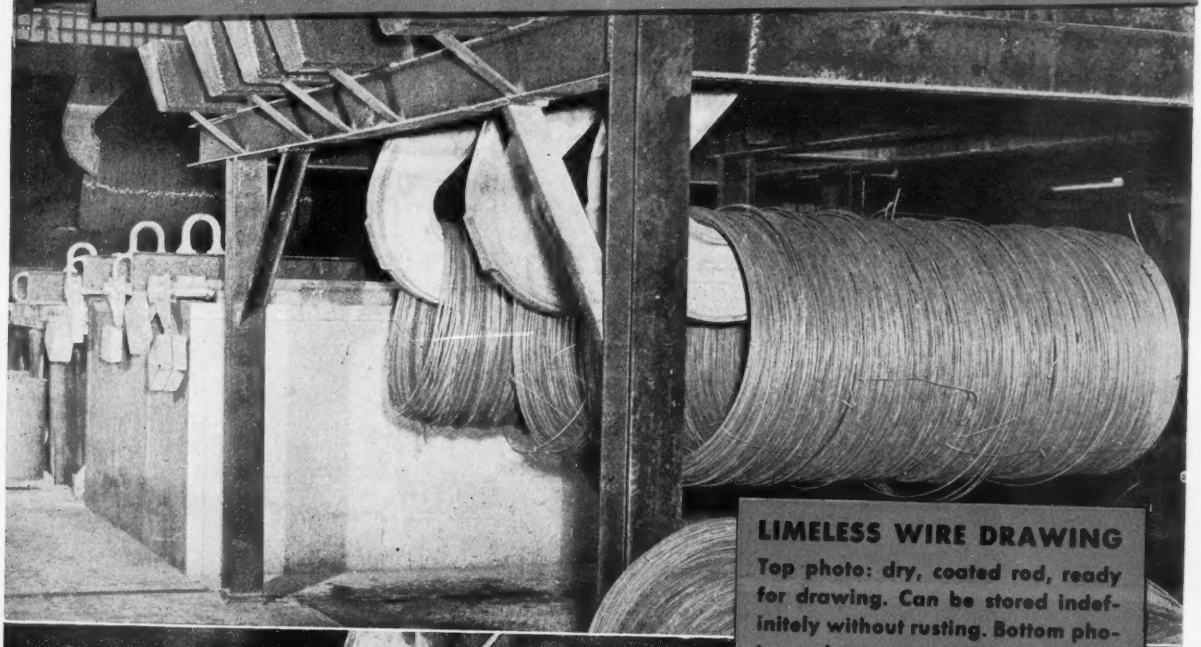
67 Wall Street, New York 5, N. Y.

Longer Die Life . . . Reduced Rejects . . . Better Finishes

No Rusting . . . No Hydrogen Embrittlement

Less Lubricant . . . Dip to Draw in Minutes – NOT HOURS

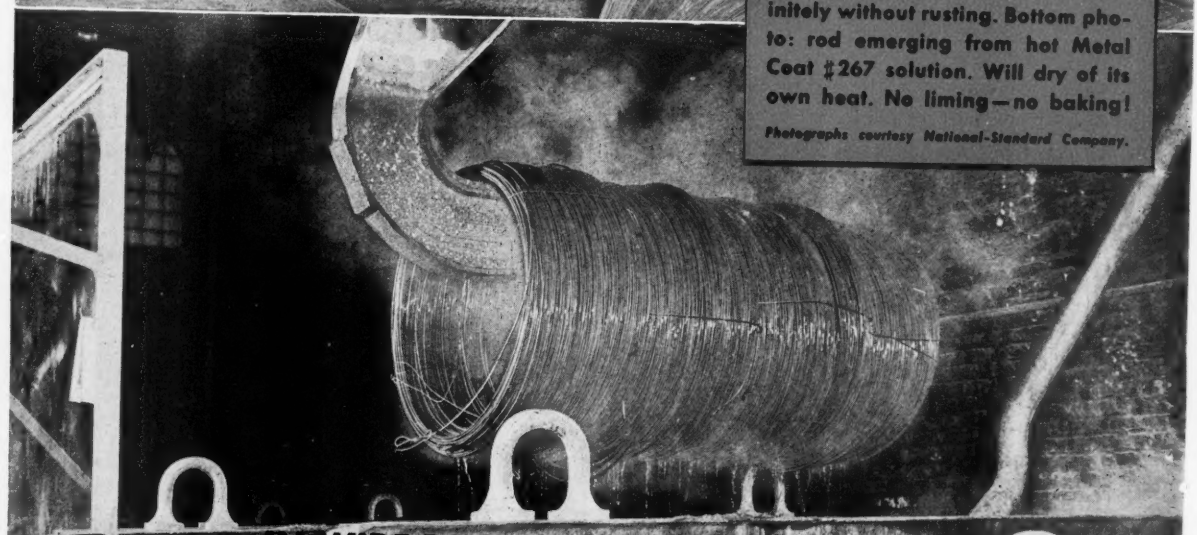
ALL THIS AND MORE WITH MAGNUS METAL COAT #267



LIMELESS WIRE DRAWING

Top photo: dry, coated rod, ready for drawing. Can be stored indefinitely without rusting. Bottom photo: rod emerging from hot Metal Coat #267 solution. Will dry of its own heat. No liming—no baking!

Photographs courtesy National-Standard Company.



IN WIRE DRAWING IT'S

Magnus

CLEANERS • EQUIPMENT • METHODS

MAGNUS CHEMICAL COMPANY • 188 South Avenue, Garwood, N. J.

IN CANADA—MAGNUS CHEMICALS, LTD., 4040 RUE MASSON, MONTREAL 36, QUE.

You Can Cut Spring Grinding Costs with NORTON Discs!

BECAUSE when you specify NORTON Discs, you have a **choice** of abrasive, a **choice** of bond, and a **choice** of grain, grade and structure. This **freedom of choice** enables you to obtain a disc of exactly the right combination—a disc with all the properties required to give you a fast, cool cut and extra long life on each of your spring grinding jobs.

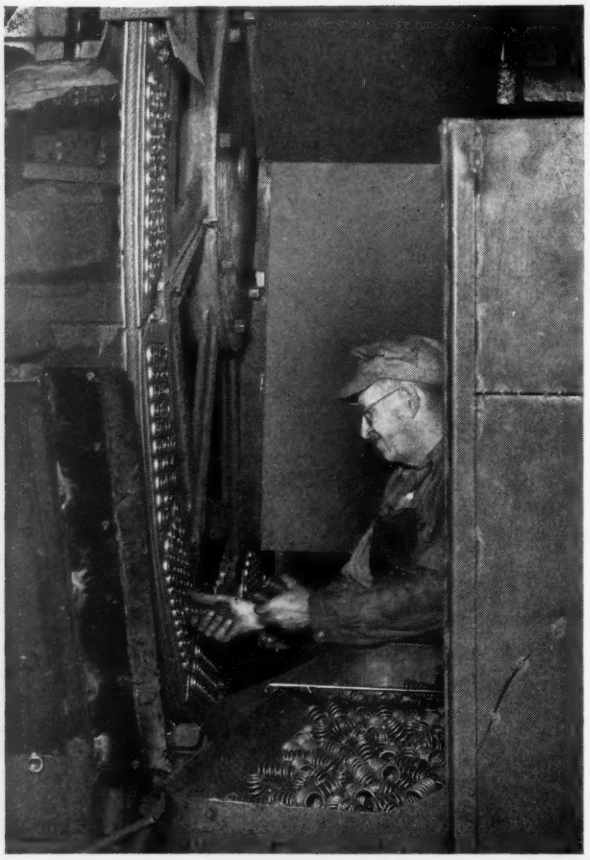
Let a NORTON abrasive engineer study your spring grinding jobs. He'll take into consideration the type of grinder you're using, the material you're grinding, the size and shape of the work, the amount of stock to be removed, and the finish desired. Then he'll recommend a NORTON Disc of the right combination.

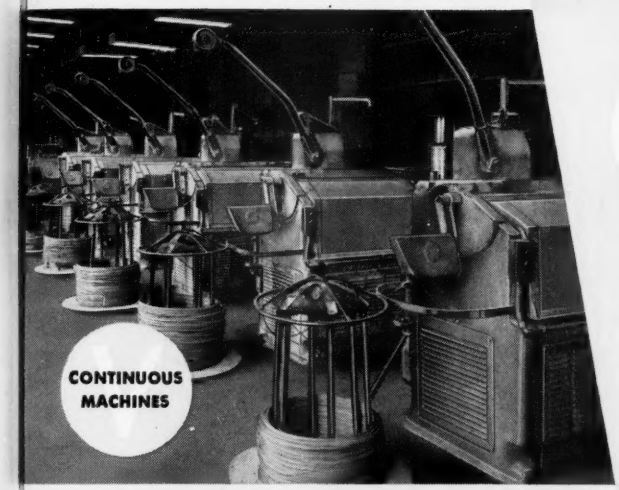
NORTON COMPANY WORCESTER 6, MASS.

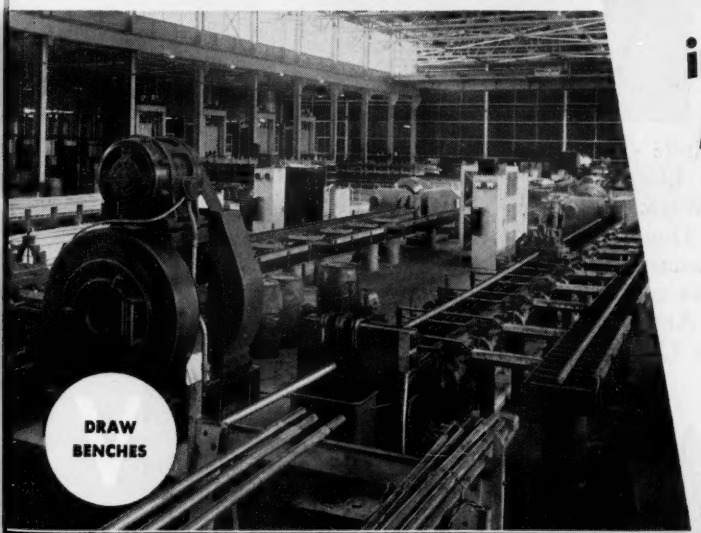
Distributors In All Principal Cities

NORTON ABRASIVES

W-1210







Vaughn means Value—

in every COLD DRAWING MACHINERY application!

Vaughn Cold Drawing Machinery returns consistent profits on your investment through values that are integral with the equipment: Speed, Versatility, Flexibility, Durability! *Let us translate these advantages in terms of your specific production problems.*

"Quick on the Draw!"

VAUGHN MACHINERY

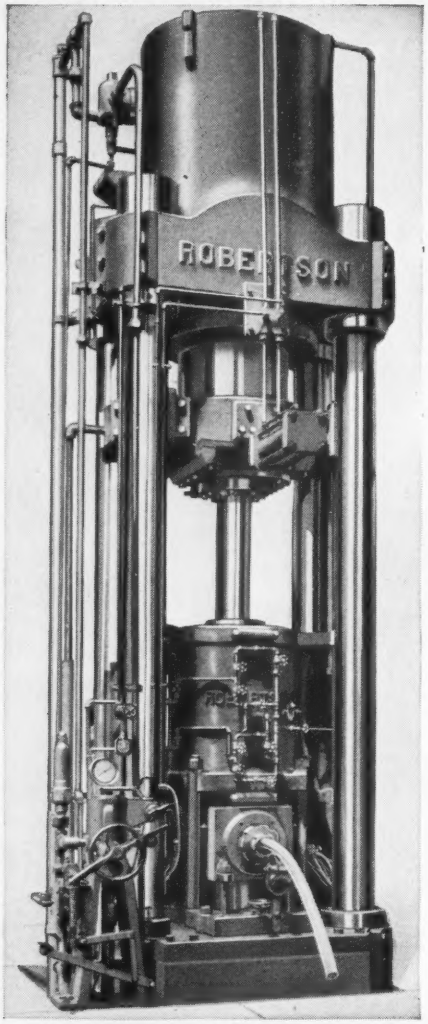
PROFITABLY USED BY LEADING WIRE MILLS SINCE 1871

THE VAUGHN MACHINERY COMPANY

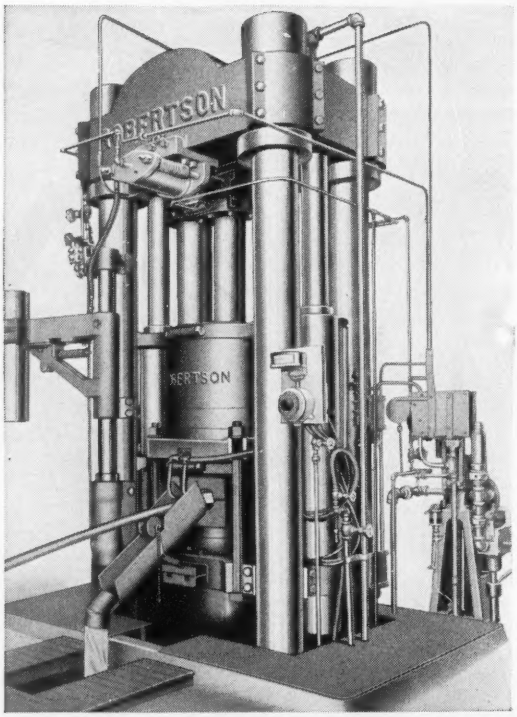
CUYAHOGA FALLS, OHIO, U. S. A.

COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

THE USERS *of* ROBERTSON EQUIPMENT...

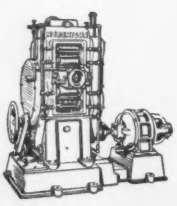


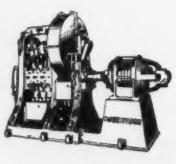
ARE THE LEADERS IN THE HOSE & CABLE INDUSTRIES

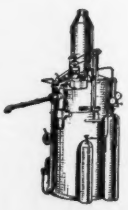


American Steel - General Cable - Hazard - Circle - Goodrich - U. S. Rubber - Simplex - Phillips Electrical - Gates - Walker - Collyer - Electric Hose - Okonite - Swan Rubber - Triangle - Northern Electric - Rome Cable - Western Electric - Crescent - Thermoid Co. - De Vilbiss - Phelps-Dodge - National Electric - Dominion Rubber - Kerite - General Electric - Roebling - Paranite - Anaconda - Boston - Kennecott - Canada Wire - Goodyear - L. M. Ericsson - Sieverts Kabelverk - Standard Telefon og Kabelfabrik - International Standard Electric Corp. - Nederlandsche Kabelfabriek - Aluminum Company of America - Aluminum Company of Canada - Narragansett Wire Company - Hewitt-Robins, Inc. - Hewitt Metals Corp. - Pirelli SA Platense

JOHN Robertson
COMPANY INCORPORATED
131 WATER STREET, BROOKLYN 1, NEW YORK
Designers and Builders of all Types of Lead Encasing Machinery
Since 1858







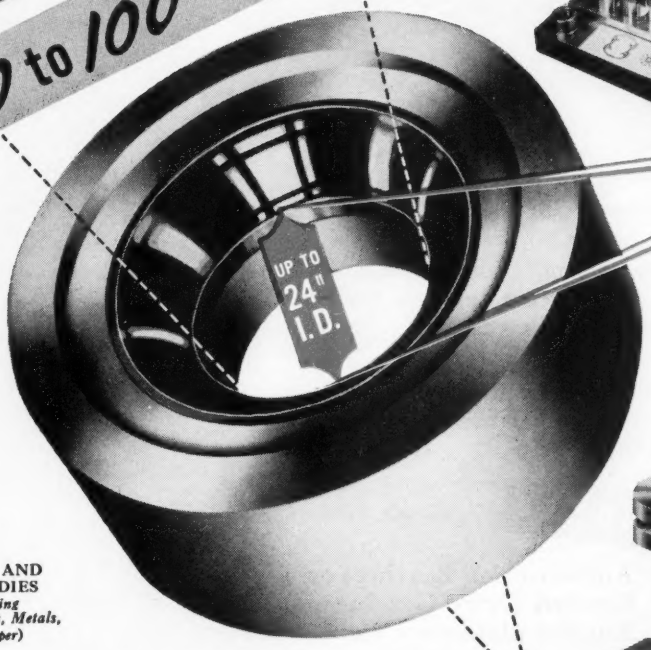
Talide (TUNGSTEN CARBIDE) Drawing Dies

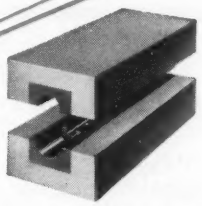
20 to 100 Times the Life of Steel Dies

DRAWING DIES (*For Wire, Tubing and Bar Stock*)

SPINNING AND CURLING ROLLERS

PIERCING AND LAMINATION DIES





SWAGING DIES (*For Forming Solid and Tubular Shapes*)

BLANKING AND FORMING DIES (*For Stamping Lamination Discs, Metals, Plastics, Paper*)

POWDER METALLURGY DIES (*For Compacting Powdered Metals and Materials*)

Talide (TUNGSTEN CARBIDE) Performance!

TUBE MANDRELS

HEADING AND EXTRUSION DIES (*For Shaping and Sizing Bolts, Nuts, Screws, and Collapsible Tubes*)

Isn't low unit cost your ultimate objective? You get more speed and output on long production runs and at lower maintenance cost with the superior quality of Talide Dies. Talide Dies out-perform and out-wear steel dies 20 to 100 times. Talide (the hardest metal made) saves up to 50 hours polishing and redressing time on a single die. And, since Talide Metal takes and imparts the smoothest finish possible, surface defects are practically eliminated. Purchase Talide (tungsten carbide) Dies in any practical shape and of inside diameter up to 24".

Write for Die and Wear Part Catalog 46-WP.

TALIDE METAL MEETS EVERY REQUIREMENT

SINTERED CARBIDES — METAL CARBIDES CORPORATION — MC TALIDE — YOUNGSTOWN, OHIO. — HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

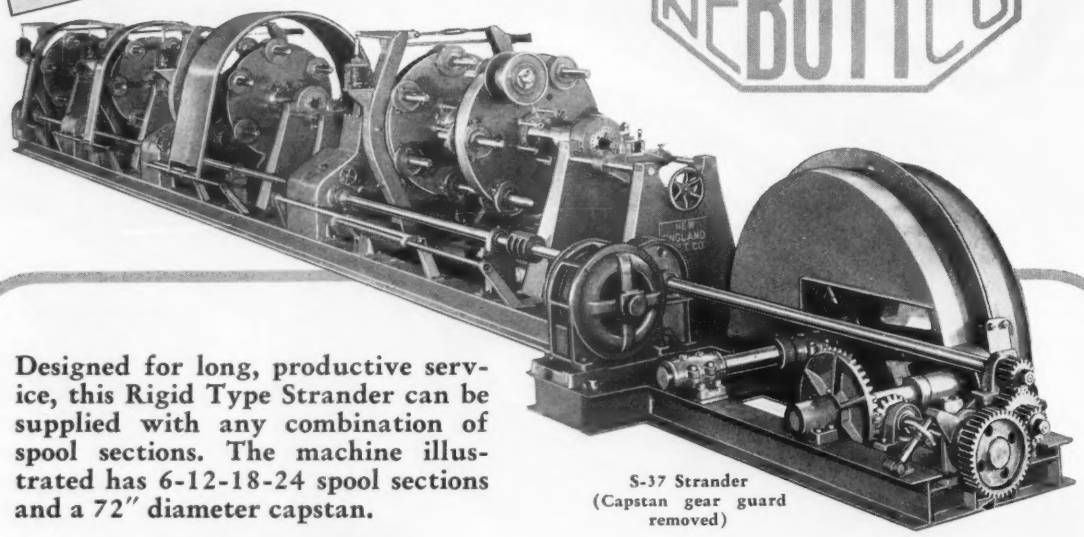
YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

for fast, uniform stranding

RIGID TYPE STRANDER

NEBUTTCO



S-37 Strander
(Capstan gear guard removed)

Designed for long, productive service, this Rigid Type Strander can be supplied with any combination of spool sections. The machine illustrated has 6-12-18-24 spool sections and a 72″ diameter capstan.

LOW MAINTENANCE

Anti-Friction Bearings on Line Shaft and Reel Mountings
Encased Drive Gearing operates in oil bath
Rugged plate steel welded construction
Large diameter Wire Guide Sheaves

AUTOMATIC CONTROLS

Stop Motion on each Wire
Solenoid Brakes

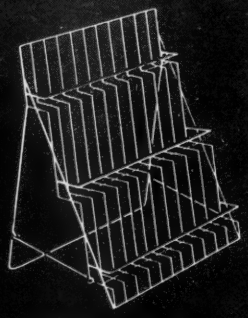
TIMESAVING SET-UP AND OPERATION

Quick-Acting Spool Locks
Each Head Reversible and Fitted with Speed Change

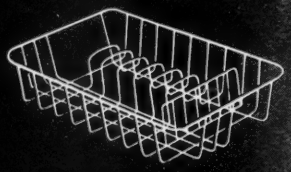
Write for further details and prices.

NEW ENGLAND BUTT COMPANY
Established 1842
304 PEARL STREET • PROVIDENCE 7, R. I., U. S. A.
JAMES DAY (MACHINERY) LTD., "FORD HOUSE", 88 REGENT ST., LONDON, W. 1, ENGLAND

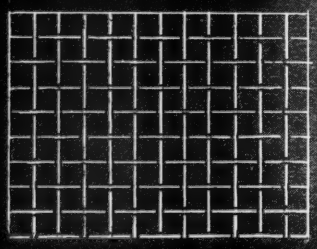
BUYERS PREFER THE *Lasting Beauty* OF ALUMINUM WIRE GOODS



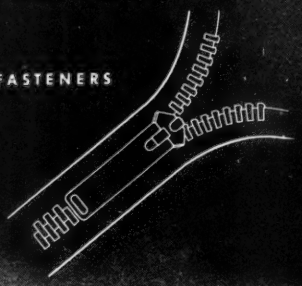
DISPLAY RACKS



DRAIN RACKS



SCREEN CLOTH



FASTENERS

Get more consumer preference for your wire goods with Alcoa Aluminum Wire. Buyers like aluminum's naturally bright surface . . . it never shows red rust, regardless of exposure.

And for fast acceptance, use the patented Alumilite process to put any color *into* the metal surface of the fabricated product. These Alumilite finishes also resist severe abrasion.

Aluminum's lightness provides three times the length of wire per pound, compared to steel, copper, and brass. Users like the ease of handling it affords.

Call your nearby Alcoa sales office for information on aluminum wire in standard shapes, gauges, alloys, and tempers. ALUMINUM COMPANY OF AMERICA, 1828 Gulf Building, Pittsburgh 19, Pennsylvania.

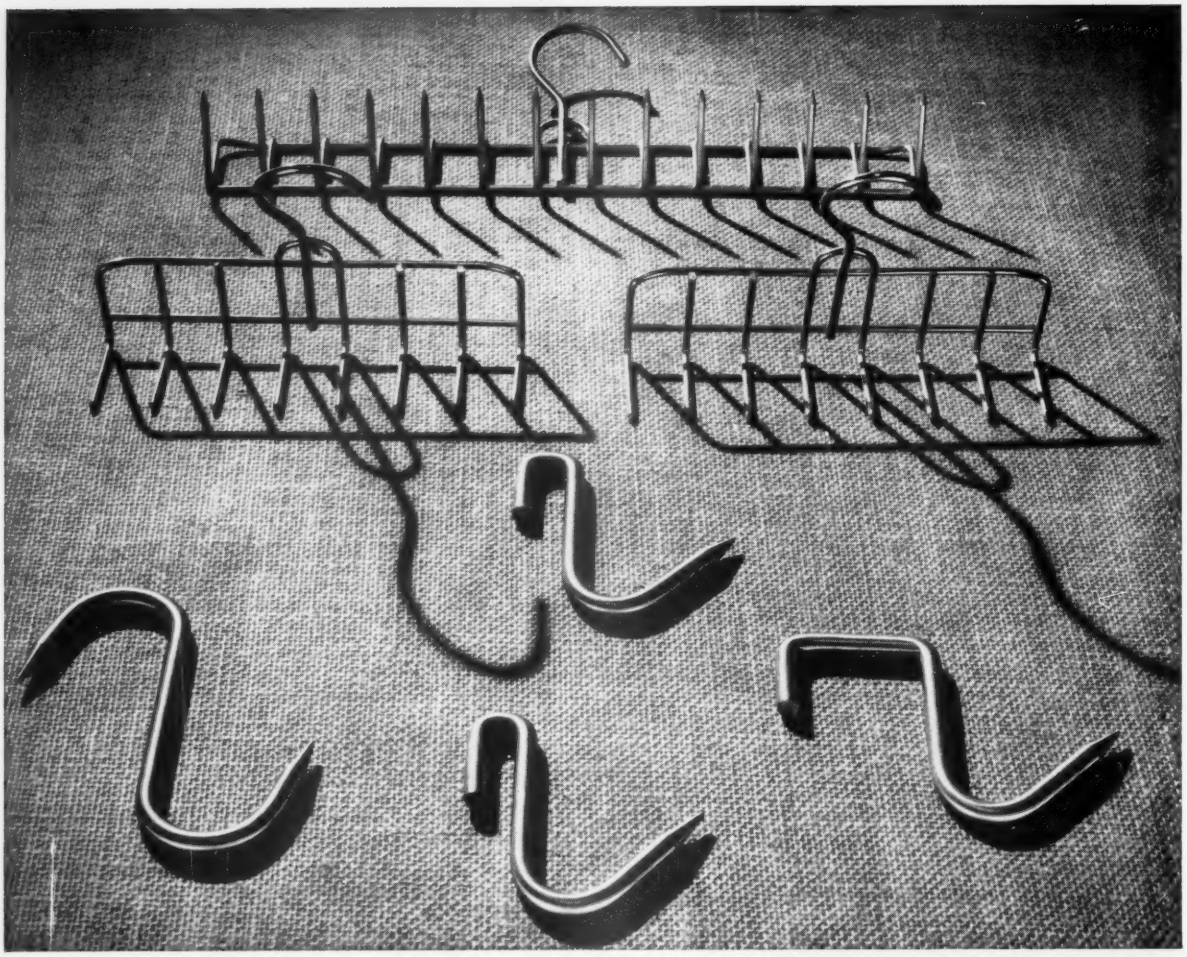
A FOOT

BECOMES A YARD

WHEN YOU USE ALCOA ALUMINUM WIRE

ALCOA FIRST IN ALUMINUM

ALCOA ® 1888 1948 60 YEARS OF SERVICE



HOW ANOTHER INDUSTRY CUTS COSTS

WITH STAINLESS STEEL WIRE

The meat industry is another good example of the economies and usefulness of ARMCO Stainless Steel Wire in all kinds of equipment.

Packers and butchers know that the initial investment in ARMCO Stainless meat hooks, bacon hangers, and sausage molds is the *last cost.*

No Plating or Replating

This solid rustless steel saves money because it never needs plating — is never out of service. There is no danger of rejections by government inspectors because of rust contamination. Hooks and molds are easy to keep clean and sanitary. And the smooth surface of Stainless Wire doesn't tear casings on meats or sausages.

If your customers' problems are corrosion or sanitation, or simply the high cost of plating, it will pay you to look into the extra advantages of ARMCO Stainless Steel Wire. There is a grade for every purpose, in many shapes and sizes.

The new Armco Electropolishing process is ideal for many small products made of Stainless Steel Wire. It is simple and inexpensive. An electrically-charged chemical bath gives a lasting lustre to the entire surface.

Write for Data

Perhaps Armco Engineers can help you solve *your* wire problems most economically. Write us for data pertaining to your products. Just address Armco Steel Corporation, 489 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO STAINLESS STEEL WIRE

ARMCO

NOW you can play Santa to yourself *all year long,* just about as easy as eating some of mom's extra-special plum pudding! No trick to it and it isn't done with mirrors. . . .

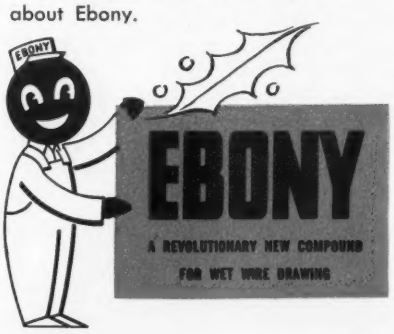
All it takes is EBONY, a revolutionary new compound for wet wire drawing developed by Standard!

This amazing new compound gives optimum results on high or low carbon or alloy steel wire . . . on copper, brass, bronze, aluminum or their alloys!

It requires no variations to be workable in water of any hardness . . . and prolongs the life of dies to a remarkable degree!

If you're looking for new and better ways to step up production and cut down operating costs, we think you'll find Ebony a mighty good answer to most of your problems. For, in test after test, Ebony has proven far superior to any wet wire compound on the market!

Find out today how you can give yourself a Merry Christmas *all year long!* Write or call for all the facts about Ebony.



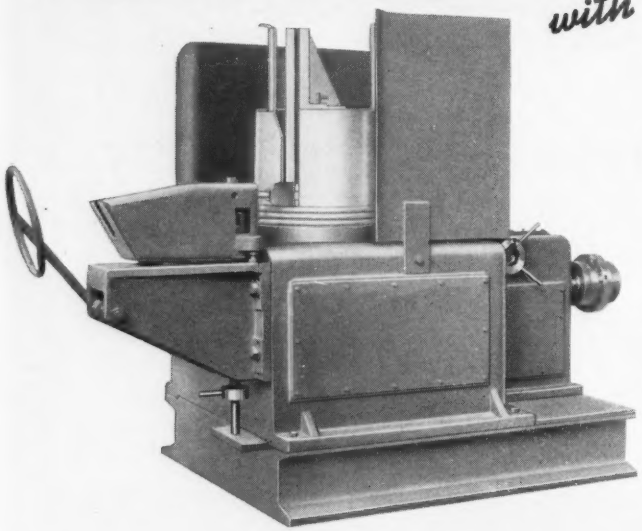
wire drawing lubricants **Standard** INDUSTRIAL COMPOUNDS CO., INC.

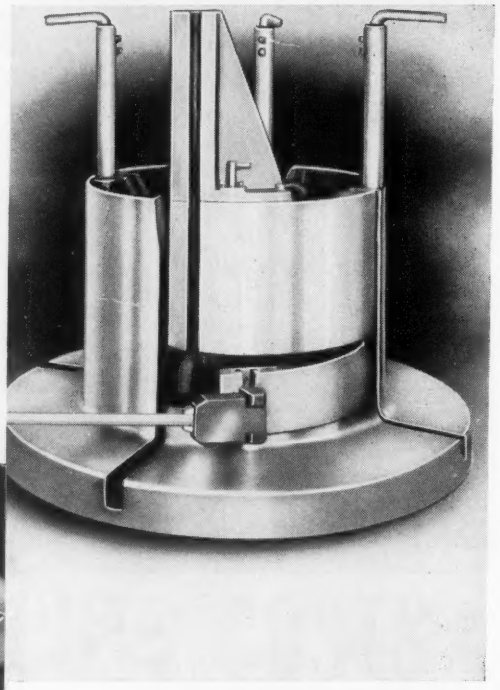
4600 WEST FERDINAND STREET
CHICAGO 44, ILLINOIS

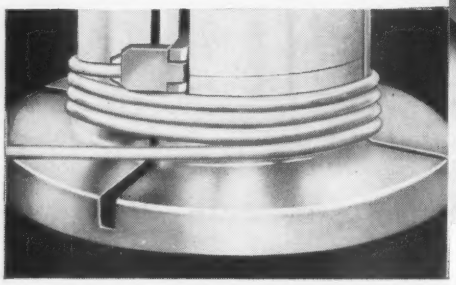
STANDS UP Under Heavy Rod Drawing Loads

SYNCRO

Single Deck Rod Blocks *with* Automatic Pull-In Starting Clamps





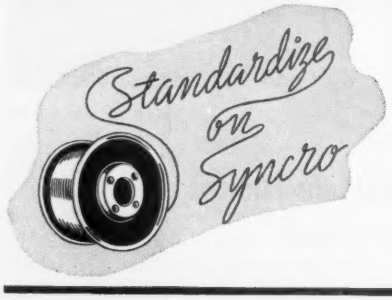


Other Syncro Machinery for the Wire Industry

Wire Drawing Machines — Stranders, Closers, Cablers, Tapers, Juters — Compound Tanks — Capstan Sections—Pay Offs—Respoolers —Heavy Duty Take-Ups—Coilers—Wire Covering Machines —Portable Cut-Off Machines—Electric Rod Pointers — Die Stringing Machines—Wire Rope Machines — Magnetic Slip Clutches—Pay-Off Reel Stands —Special Units.

Syncro Single Deck Rod Blocks incorporate cone or hour glass type of worm drive. They feature the Automatic Pull-In Starting Clamp—a novel, patented starting device that eliminates stopping of block during threading-up operation. Permits drawing operation to be run continuously until coil is completed. There are no starting chains or cable to score your drawing blocks.

Syncro also builds Double Deck Rod Blocks (without the Starting Clamp), for combination heavy rod drawing and shaving.



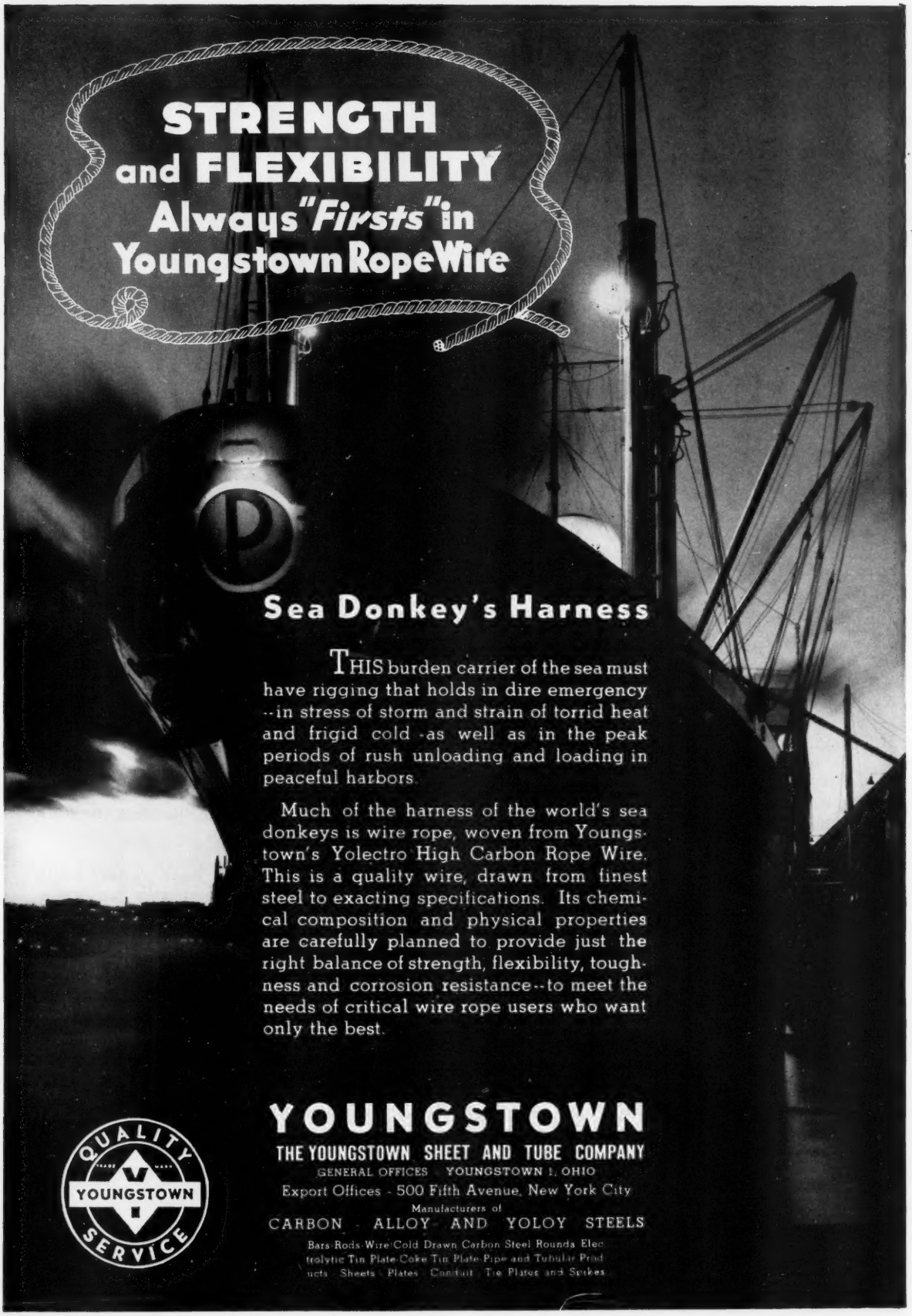
Machinery for the Wire Industry

SYNCRO MACHINE COMPANY

611 Sayre Avenue **Perth Amboy, N. J.**

Affiliated Company

Winget-Syncro, Rochester, Kent, England


STRENGTH
and FLEXIBILITY
Always "Firsts" in
Youngstown RopeWire
Sea Donkey's Harness
THIS burden carrier of the sea must have rigging that holds in dire emergency --in stress of storm and strain of torrid heat and frigid cold -as well as in the peak periods of rush unloading and loading in peaceful harbors.
Much of the harness of the world's sea donkeys is wire rope, woven from Youngstown's Yolectro High Carbon Rope Wire. This is a quality wire, drawn from finest steel to exacting specifications. Its chemical composition and physical properties are carefully planned to provide just the right balance of strength, flexibility, toughness and corrosion resistance--to meet the needs of critical wire rope users who want only the best.
QUALITY
YOUNGSTOWN
SERVICE
YOUNGSTOWN
THE YOUNGSTOWN SHEET AND TUBE COMPANY
GENERAL OFFICES YOUNGSTOWN 1, OHIO
Export Offices - 500 Fifth Avenue, New York City
Manufacturers of
CARBON - ALLOY - AND YOLOY STEELS
Bars-Rods-Wire-Cold Drawn Carbon Steel Rounds Electrolytic Tin Plate-Coke Tin Plate-Pipe and Tubular Products - Sheets - Plates - Conduit - Tie Plates and Spikes

PROFIT TALKS!

and it talks loud to users of carbide dies in industry . . .

V-R CARBIDE DIES

Incorporating FOUR of the most outstanding carbide die developments in drawing die history, V-R Carbide dies assure you of increased profitable production.

Profitable drawing operations are determined by the quality of the carbide dies you are using.

For those severe, high volume production jobs, call on V-R because only V-R Carbide dies contain all these exclusive features:

● Carbide die developments originating from the demands in your shop, are a standard feature in every V-R Carbide Die.

1 Extra wide tapered front and back openings for easy inspection and simple maintenance. Remember, NO steel to cut on resizing or refinishing operations on V-R dies.

2 Exclusive tapered nib design provides tremendous internal nib strength. Perfect concentricity of nib is your assurance of on-tolerance production.

3 Preformed rough cored back relief, built right into your V-R die eliminates costly die room coring operations over the entire range of hole sizes.

4 Of special interest to die users are the V-R Carbide dies now being furnished, rough cored to finish, at hole sizes below .015". These rough cored dies are available in dies sizes R-0, R-1, R-2, and R-3, rough cored at .004" and .010".

District Sales and Service in Principal Cities

V-R CARBIDE and TANTUNG

WAUKEGAN • ILLINOIS

vascoloy-ramet corporation

An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

The Wire Outlook

Within less than a week following the election, the security exchanges registered the convictions of big-business owners — the stockholders — that sledding for business may not be easy for the next four years.

Certain it is, in spite of lip service to holding the price line, that inflationary tendencies have been increased, to which, after a time, there is bound to be a reaction. War and price controls might defer it, but unless there were a complete turnabout on governmental extravagance and professed labor policies, an ultimate crash becomes highly probable. Even now the Government spokesmen are talking of increased spending all along the line and labor is girding itself for its fourth round of demands.

Army figures, from World War II analyses, show that in the United States approximately 45% of the people were graded with "D-minus", "D" and "C-minus" minds — low to medium intelligence. These are the people who do not get along through their own ability and who always look for anything they can get for nothing. They are the people whose fears, prejudices and hopes were appealed to successfully in the recent election by both unscrupulous labor leader and politician alike. They constituted the marginal majority, who gave the New Deal its so-called "mandate".

We are forced by circumstances to re-arm, and it costs money. We are forced also for the same reason to face growing shortages, as stockpiling and diversion of raw materials to the manufacturer of war materiel gathers momentum. The latter as yet is largely in the blueprint stage.

Economists believe that accelerated government spending, a probable attempt to restore price controls and a possible attempt to back up these controls through rationing are factors with which industry will have to reckon. But regardless of efforts to hold matters in check, we are likely to have further inflation. The "gray" markets would then again become "black" markets on an expanding scale. Old man Economic Law cannot for long be defied successfully, as we have had plenty of opportunity to observe.

New equity capital is needed in many lines. Electric utilities, for instance, are said to require six billion dollars for construction and new equipment to keep pace with expanding industrial and consumer needs. With the present confiscatory tax structure, such capital is becoming increasingly hard to raise. It is needed for prosperity.

Within a short time we shall have evidence as to the direction the administration and the new Congress will take. Based on past history and campaign promises, the future does not look too rosy, but there is always the possibility and the hope that full responsibility for the welfare of the country may have a sobering effect on the newly elected representatives of the people.

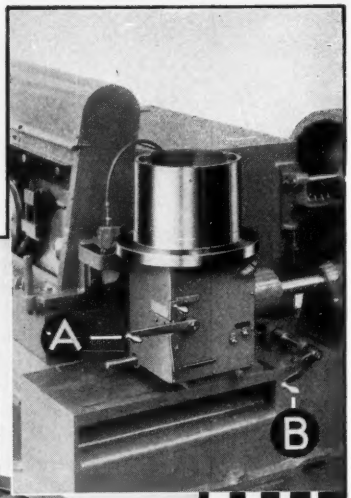
The steel industry is producing at exceptional levels and prevailing opinion is that greater volume will be forthcoming in 1949 because of new ingot capacity coming into operation and provided there are no long, major strikes.

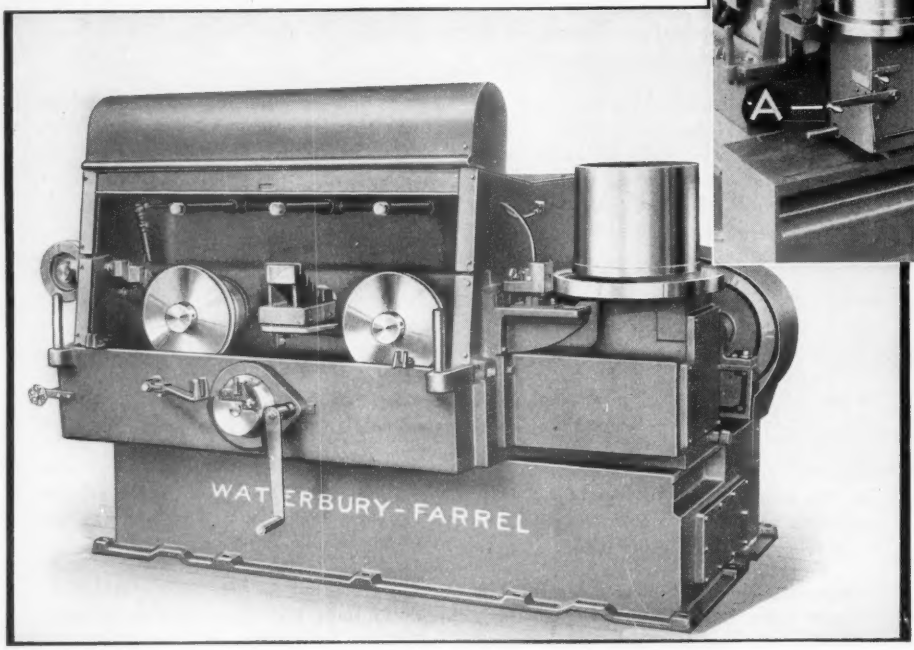
Many mills have satisfactory stockpiles of scrap on hand and the scrap shipments have been freer than for some time. Despite this favorable scrap position, greater quantities will be needed if the enlarged production schedules of 1949 are to be met.

For the moment we are faced with a period of watchful waiting. We look for the best, mindful that this is a great and virile country. It is nonetheless hard to overlook the fact that the election was won by demagogues, whose interests were their own, rather than those of the very people to whom they appealed for support.

—from the Editor's Desk

WIRE DRAWING MACHINES





FOUNDED WATERBURY FARREL 1851

by WATERBURY-FARREL

WITH WIRE BLOCKS WHICH *rotate in either direction*

Upright Cone Continuous Machines with provision for quickly changing the rotation and position of block.

Two conveniently located removable handles do the trick in jig time—

A — changes direction of rotation
B — shifts position of block . . .

The machines are available with blocks of various diameters or with spooling devices. Our wire drawing machinery is described in Catalog W.

• WIRE AND ROD MACHINERY • COLD HEADING MACHINERY, ETC. •

WATERBURY FARREL
FOUNDRY & MACHINE COMPANY
WATERBURY • CONNECTICUT • U•S•A

CHICAGO CLEVELAND NEWARK, N. J.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 23 DECEMBER, 1948 No. 12

Designated as

Official Publication By The Wire Association

Contents

Editorial Page 1113

Fatigue Testing of Wire by F. A. Votta, Jr. 1117

Aluminum Coating Steel by C. B. Ulshafer 1124

Evaluation of Pickling Inhibitors from the Standpoint of Hydrogen Embrittlement. III. Conditions of Cathodic Pickling by C. A. Zapffe and M. E. Haslem 1126

The Handling of Webs and Monofilament Materials, Part II by C. A. Litzler 1131

Wire Association Convention—1948 1134

Labor Relations by John B. Stone 1143

Government Wire Production Information 1144

Outstanding Personalities of the Wire Industry 1147

A Review of Recent Wire Patents 1152

Phosphate Coating Facilitates Wire Drawing and Inhibits Rust 1159

Index to Advertisers 1177

Where-to-Buy 1178-1182

Index to Editorial Content, 1948 1183

Index to Authors, 1948 1184

WIRE and WIRE PRODUCTS is indexed regularly by Engineering Index, Inc., New York, N. Y.

— ASSOCIATE EDITORS —

Kenneth B. Lewis, Consulting Wire Mill Engineer

Lancaster, Allwine & Rommel, Consultants on Patent Information

Richard E. Brown, General Manager
R. S. Spengel, Business Manager
E. D. Sickels, Advertising Manager

Publication Office: Jersey City, N. J.
Executive Office: Stamford Trust Co. Bldg., 300 Main St., Stamford, Conn.

Annual Subscription, U. S. $5.00, Canada $5.00

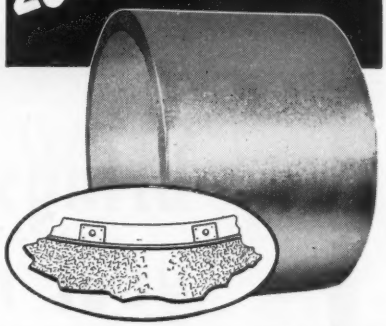
50 Cents a Copy in U. S. Issued Monthly Foreign $7.50

October Convention Issue $1.00 a Copy

January Convention Discussions Issue $1.00 a Copy

Copyright 1948, Quinn-Brown Publishing Corp. WIRE AND WIRE PRODUCTS is fully protected by copyright and nothing that appears in it may be reprinted wholly or in part without permission.

Extra strength
Extra service
and
20% less weight



STEVENS

"Reinforced Type"

FLANGED STEEL TRAVERSES

for wire and cable

. . . have extra strength where it is needed most—at bolt holes and base of the flange. This reinforcing makes possible the use of lighter gauge steel, saving up to 20% in weight while increasing overall strength.

Stevens Flanged Steel Traverses have given as much as sixteen years' service without refinishing or major maintenance, according to actual experience records. In many cases their use has doubled the number of trips per reel before cut downs or scrapping of wooden heads.

They are manufactured in sizes up to 56" diameter and 48" traverse —in plain, painted or hot dip galvanized finishes—as light as 18-gauge steel. Width of flange and number of bolt and drain holes are furnished to your specifications. Write for prices.

• • •

Manufactured Under License Arrangements With Western Electric Co., Inc.

REPUBLIC STEEL

NILES STEEL PRODUCTS DIVISION

REPUBLIC STEEL CORPORATION

NILES • OHIO

FIRTHALOY

"THE STANDARD CARBIDE"

Firthaloy

brings to your mill these advantages—

- machine speed-up
- minimum down-time
- longer runs
- maximum die life
- uniform quality of products—

the essentials of operating economy

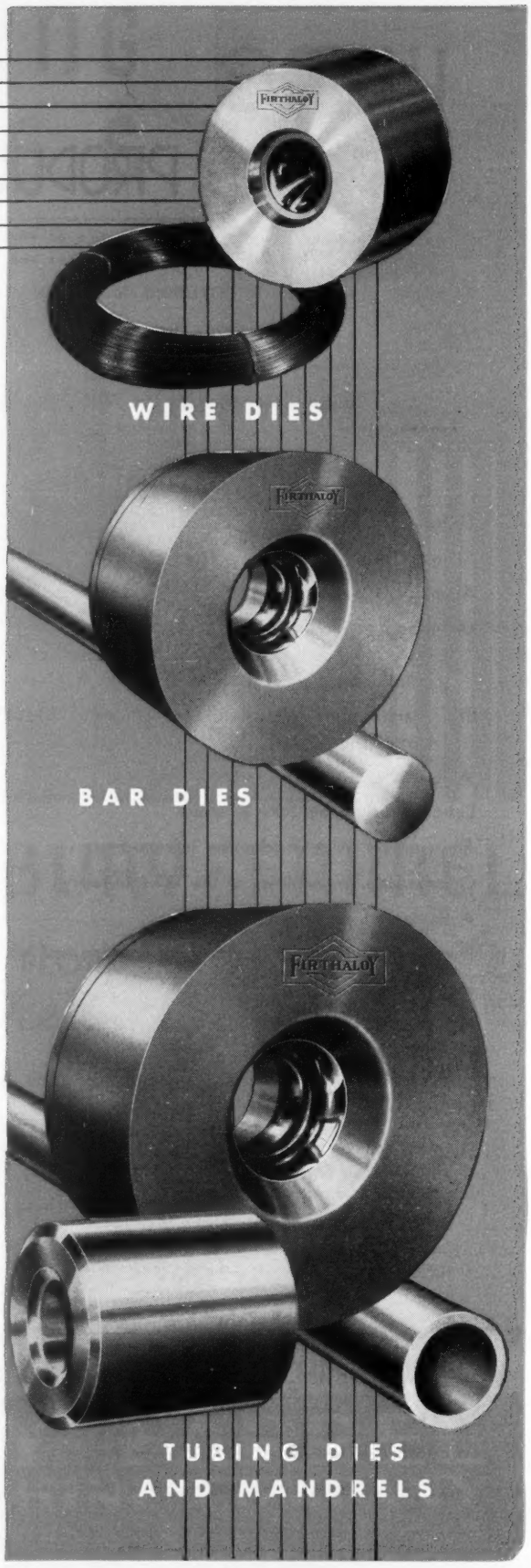
Call

Firth Sterling

STEEL & CARBIDE CORPORATION

McKEESPORT, PA. • NEW YORK • HARTFORD • PHILADELPHIA • PITTSBURGH

CLEVELAND • DAYTON • DETROIT • CHICAGO • LOS ANGELES



WIRE
AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 23 DECEMBER, 1948 No. 12

Fatigue Testing Of Wire

By F. A. Votta, Jr., Engineer—Apparatus Div.,
Hunter Spring Company,
Lansdale, Pennsylvania

A paper presented before the Wire Association Convention at Pittsburgh, Pa., October, 1948.

THE fatigue characteristics of any material have long been recognized as the most valuable information which a designer can possess. The principal cause of machine failure is the fatigue fracture of parts in dynamic service. Heretofor, fatigue testing techniques have been limited to the research laboratory because of the complicated testing equipment involved and the requirement of skilled personnel to perform the tests in order that accurate results could be obtained.

★ ★ ★

IN the design of springs, fatigue characteristics have always been considered extremely important and are taken into account by spring designers wherever possible. In many design instances it is necessary for small springs to be operated at extremely high stress values and, therefore, the fatigue characteristics of the wire are of prime importance. In such cases a rapid fatigue inspection technique is desirable.

★ ★ ★

A NEW rotating beam wire fatigue testing technique has been developed at the Hunter Spring Company in Lansdale, Pennsylvania by means of which small diameter wire may be quickly and accurately tested. The significance of this new development rests in the fact that wire fatigue testing may be made a part of the routine inspection process of both the producer of small diameter wire and the ultimate consumer. Modern statistical methods of quality control may also be used with ease; the speed and accuracy of the technique makes the plotting of control charts and frequency distribution curves a simple matter.

★ ★ ★

THE principle of this technique, recently developed by the Hunter Spring Company is the looping of a specimen of wire through a complete 180 degree angle and rotating the looped wire until it fails under reversed bending or until the specimen "runs-out". The maximum bending stress (at the apex of the loop) may be quickly and accurately calculated by using simple formulae which will be discussed later in this paper. The value of the stress may be made as great as desired so that specimens may be rapidly brought to failure.

★ ★ ★

FOR example, specimens of 0.018″ diameter music wire may be stressed to a value of 170,000 psi and brought to failure in a matter of about four minutes after having been subjected to an average of 14,400 complete stress reversals. The significance of such a fatigue testing method cannot be overemphasized. By formerly used methods, reliable fatigue tests could not be run on wire sizes under 0.020″ — and even larger sizes often could not be stressed at values high enough for rapid fatigue testing.

★ ★ ★

THIS new testing method is so simple that inspectors without previous physical testing experience can perform the necessary calculations, set up the test and complete it without previous experience. The possible errors are so small that accuracies within one percent of theoretical calculations are obtained in routine inspection.

★ ★ ★

SINCE single samples of wire may be brought to a high enough stress so that they may be fractured in a matter of minutes, it is possible to plot a control chart of the wire drawing process according to standard statistical methods of quality control. The wire producer can use this means for better controlling the quality of his product, and the wire con-

sumer can make use of such tests as a basis for wire acceptance.

★ ★ ★

IT is, of course, possible to conduct a complete investigation into the fatigue characteristics of a sample, including the determination of the endurance limit of the wire, in the matter of a few days. For example, a complete S-N curve for a sample of .006" diameter stainless steel spring wire was determined in four days using two of these machines. A total of twenty specimens were run at six different stresses—two of the samples running over ten million cycles without failure.

★ ★ ★

THE application of this simplified fatigue testing method in the design of devices using wire forms and springs is an important one. Fatigue information is by far the most accurate means of predicting wire life in dynamic service. It detects the influence of surface defects (nicks, scratches, etc.) with extreme sensitivity.

★ ★ ★

Description and Method of Use

THE testing instrument (Figure 1) consists essentially of a synchronous motor driven chuck and a readily adjustable sapphire bushing head to position the end of the test specimen which is not clamped in the chuck. The bushing head is secured in one of a number of holes spaced at equal intervals of precisely one inch in a horizontal stainless steel bar. This bar is adjustable horizontally and its position may be easily determined by reference to a 0.001" increment dial indicator. In this manner the chuck-bushing distance may be set to the nearest .001" throughout the whole range of the instrument. Figure 2 shows a view of the fatigue tester with the cover removed. Since the motor which is used to drive the chuck is synchronous, its speed is constant and a standard electric time meter graduated in tenths of a minute can be used to count the number of cycles. Two guides may be used to support the wire near, but not in, the region of maximum stress. They act to prevent excessive vibration and sag in the specimen and are mounted on Alnico magnets so that they may be quickly but securely positioned anywhere

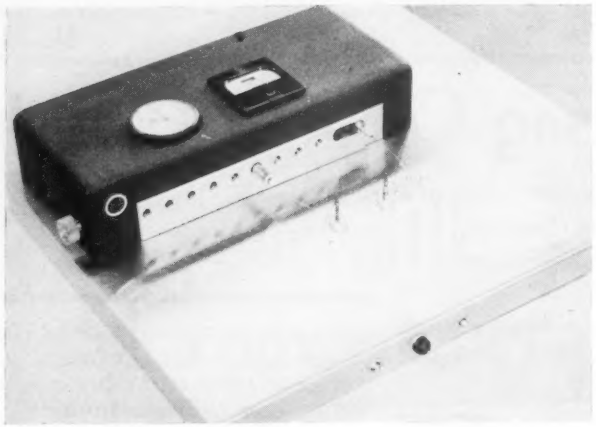


Figure 1.

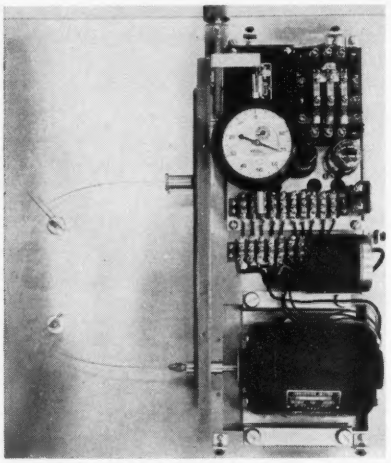
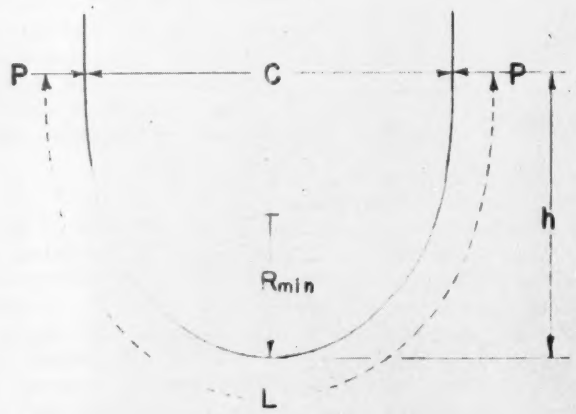


Figure 2.

SUBJECT FORMULAE FOR ROTATING BEAM FATIGUE TESTING



$C = 1.19R\frac{Ed}{S}$ $\quad h = 0.835C \quad L = 2.19C$

$P = 0.141\frac{Ed^4}{C^3}$ $\quad R_{min} = 0.417C$

d = Wire Diameter $\quad$ S = Bending Stress

Position of Break Pct of L	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25
Stress Pct of Max	99.6	98.3	96.2	93.3	89.8	85.6	80.9	75.7	70.2	64.4

Figure 3.

on the steel apron of the machine. The right-hand guide also has mounted on it a phosphor bronze wire form which acts as an electrical contact. When the specimen being tested breaks under repeated stress the section remaining in the chuck makes contact with this wire form. This completes an electrical circuit through the wire, into the electronic holding circuit.

★ ★ ★

THE instrument is so arranged electrically that it is not necessary to send current through the motor bearings except for the split second it takes to operate the cut-off relay when the specimen breaks and contacts the phosphor-bronze wire form. The electronic circuit which will operate under a contact resistance of two megohms, is sensitive enough so that even the lightest contact between 0.005″ diameter wire and the wire form will cause the circuit to be broken.

★ ★ ★

A TEST is made (Figure 3) by: (1) calculating the wire length L and the chuck bushing distance C corresponding with the testing stress S desired in the wire (its modulus of elasticity E, and diameter d being known); (2) cutting such a length (with allowance for insertion into chuck and bushing), clamping it in the chuck, inserting the other end into the bushing, and locating the supporting guides; and (3) turning on the machine and starting the motor by pressing the reset button. The specimen will then run until failure occurs at which time the automatic cut-off will de-energize the motor and timing unit. By noting the recorded starting and stopping times the number of cycles can be quickly determined.

★ ★ ★

IF, after fracture has occurred, the two pieces are not of the same length (meaning that the point of fracture was not at the point of maximum stress), the test is not lost as the stress at the point of fracture can be readily calculated by measuring the location of the break as a percentage of the total specimen length away from center (see Figure 3).

★ ★ ★

Theory and Formulation

THE basis of the theory behind this testing technique is the fact that if any elastic element is bent into a loop held freely so that the axis of the element at the points of retention are exactly parallel the only external forces acting on the element are two equal and opposite forces normal to the axis at the points of retention. Under these conditions the following relationships may be derived: (1) the length of the loop is 2.19 times the base, (2) the height of the arch is 0.835 times the base, (3) the minimum radius of curvature occurs at the apex of the loop and is exactly 0.417 times the base, and (4) the bending stress at the point of minimum curvature bears a simple linear relationship to any of the four physical dimensions (length, height, base, minimum curvature).

★ ★ ★

THE following formulae express the exact relationships:

★ ★ ★

$$C = \frac{1.198\ E\ d}{S} \qquad R_{min} = 0.417\ C$$

$$P = \frac{0.141\ E\ d^4}{C^2}$$

$$h = 0.835\ C$$

$$L = 2.19\ C$$

★ ★ ★

WHERE E = Young's Modulus, d = wire diameter, C = chuck-to-bushing distance, h = height of loop, L = length of wire external to bushing and chuck, R_{min} = minimum radius of curvature, P = bushing load or normal force at the chuck and bushing, and S = bending stress.

★ ★ ★

THE simplicity with which sample length and chuck to bushing distance may be calculated from the desired test stress and the construction of the apparatus, cause the error involved to be quite low—well within one percent.

★ ★ ★

OPERATOR'S errors are reduced to a minimum, since the only measurements required are the sample length and chuck to bushing distance.

★ ★ ★

THE significant distinctions from previously used methods of fatigue testing wire (aside from convenience, speed, and amount of stress obtainable) are: (1) elimination of the necessity of submerging the wire in an oil bath in order to suppress vibration, (2) the simplicity of stress calculation without any assumptions of small slopes in the derivation, and (3) the usability of a loose bushing hole to hold the wire.

★ ★ ★

Typical Tests Performed

SINCE the inception of this testing technique before the war, some four hundred investigations have been performed at Hunter Spring Company in order to learn more of the fatigue characteristics of small diameter wire. The original laboratory set-up consisted of four testing units. The accuracy of these four testing heads was first verified by running similar test specimens in all of them. After it was determined that the results obtained were uniformly accurate, various investigations into the fatigue properties of small diameter wire were started.

★ ★ ★

ONE of the first investigations was the determination of the effects of slight initial curvature of the specimen on its fatigue characteristics. The illustration (Figure 4) shows a comparison between a straight specimen and a specimen with an extreme amount of curvature (radius = 35¾″). Due to the increased stress resulting from this initial curvature, the life of the wire tested was decreased from 26,500 cycles to 22,500 cycles or 15.1% at a mean stress of 152,200 psi. However, this initial curvature was much in excess of that found under normal test conditions and it is, therefore, indicated that small amounts of initial curvature, such as wire set in coils, produce negligible inaccuracies and may be neglected in the calculation of test results. It should be noted that these test results are plotted in the form of frequency distribution curves which indicate a normal variation in the number of cycles at a given stress.

★ ★ ★

THE frequency distribution curve is plotted by running a

number of samples at a fixed stress and recording the number of cycles to produce failure by dividing the cycle scale into a number of increments or cells. The frequency of occurrence of a fatigue failure in a number of these cells will form a frequency distribution curve which clearly indicates both the dispersion and the mean value of the number of cycles.

★ ★ ★

THE next illustration (Figure 5) shows the S-N curve for a specimen of .010″ diameter stainless steel spring wire—points plotted in the form of frequency distribution curves—showing that the dispersion of points (ie number of cycles) increases as the stress decreases. Therefore, if a specimen of wire were to be run at a fairly high stress the frequency distribution curve would be well defined by plotting a relatively small number of points. This method of recording data suggested a means of testing and comparing a number of samples from different coils of wire in order to determine any variation in the mean number of cycles and dispersion at a given stress.

★ ★ ★

THE method of determining the standard distribution and the minimum allowable number of cycles is a simple one. As an example (Figure 6) consider a torsion spring wound from .020″ diameter music wire. The spring is a common type used in radio switch mechanisms and is required to function at a very high stress range for a minimum of 50,000 operations. A coil of wire is selected at random from stock and a number of torsion springs coiled. A number of samples are taken from the same coil and subjected to the rotating beam fatigue test in order to plot a complete S-N curve. The torsion springs are then subjected to a fatigue test at the normal operating range and a frequency distribution of the number of cycles to failure is plotted. If the springs all perform satisfactorily the rotating beam S-N curve then represents the fatigue characteristics of an acceptable coil of wire and may be used as a standard. From this S-N curve a high stress value is selected so that failure of the specimen will occur at an average value of around 15,000 cycles (ie 4.2 minutes at 3600 rpm). A number of samples from the selected coil of wire are fatigue tested at this high stress and the standard frequency distribution is determined.

★ ★ ★

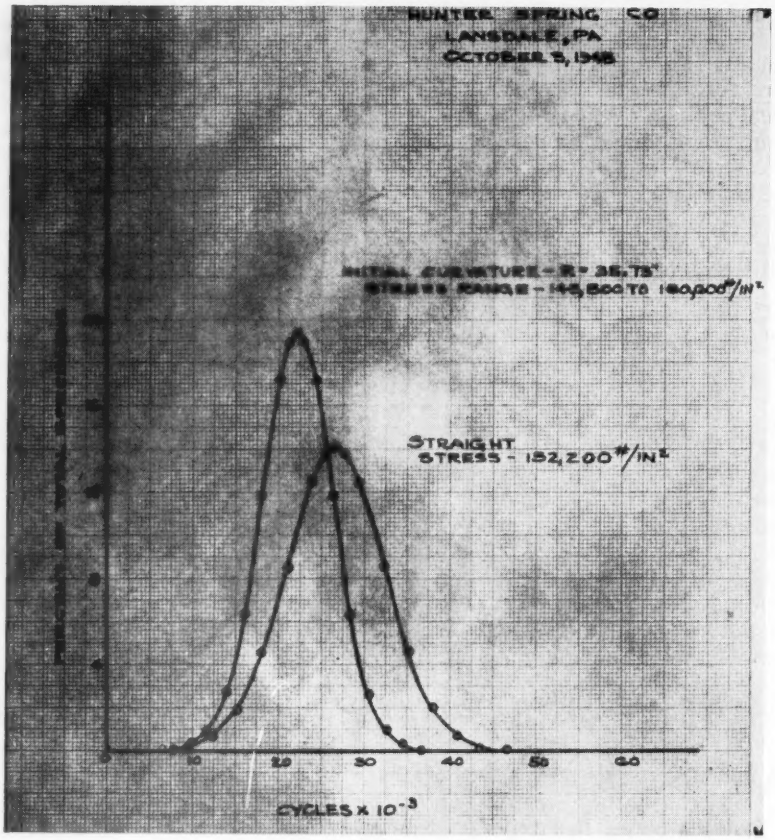


Figure 4.

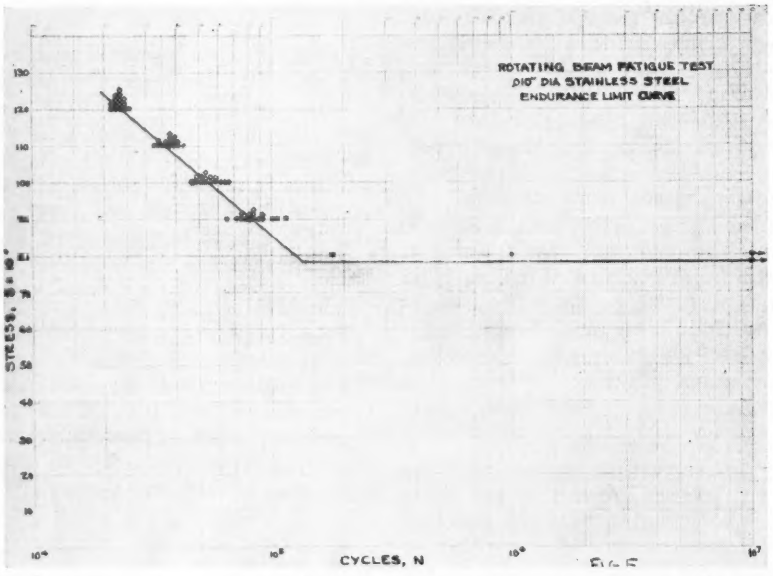


Figure 5.

THIS technique is used at Hunter Spring Company as an acceptance test for some types of small diameter wire. The illustration (Figure 7) shows a typical series of tests. The large distribution on the left was plotted using samples from coils of wire which were known to have acceptable fatigue limits — having been previously used to make torsion springs which were subjected to reversed bending tests and found to be satisfactory. Once the acceptance limits are determined the standard procedure is to take samples of incoming wire, subject them to the rotating beam test, plot the results in the form of a frequency distribution curve, and compare with previous results. It can be seen that it becomes a simple matter to conduct investigations of this type once the standard is established. Samples taken from coils 1, 4 and 5 all showed fatigue characteristics similar to the standard while coil 6 had improved fatigue life. Coils 2 and 3 are sub-standard as indicated by the frequency distributions. Note that the frequency distributions vary in both the mean and the amount of dispersion. This technique has proven invaluable in pre-selecting coils of wire for critically stressed springs. The savings in time and money involved in being able to predict the fatigue characteristics of a spring from rapid rotating beam fatigue tests on the wire used in its manufacture are important ones.

★ ★ ★

A SIMILAR technique may be used in the case of extension and compression springs which are subjected to unidirectional torsional stresses. Figure 8 shows a complete experimental investigation of a compression spring wound from .022″ diameter music wire and operated at various stresses in order to obtain a complete S-N curve for torsional stress. These torsional characteristics may then be easily correlated to a rotating beam S-N curve for the same wire (Figure 9).

★ ★ ★

A GREAT number of tests on a variety of types and diameters of spring wire have indicated that

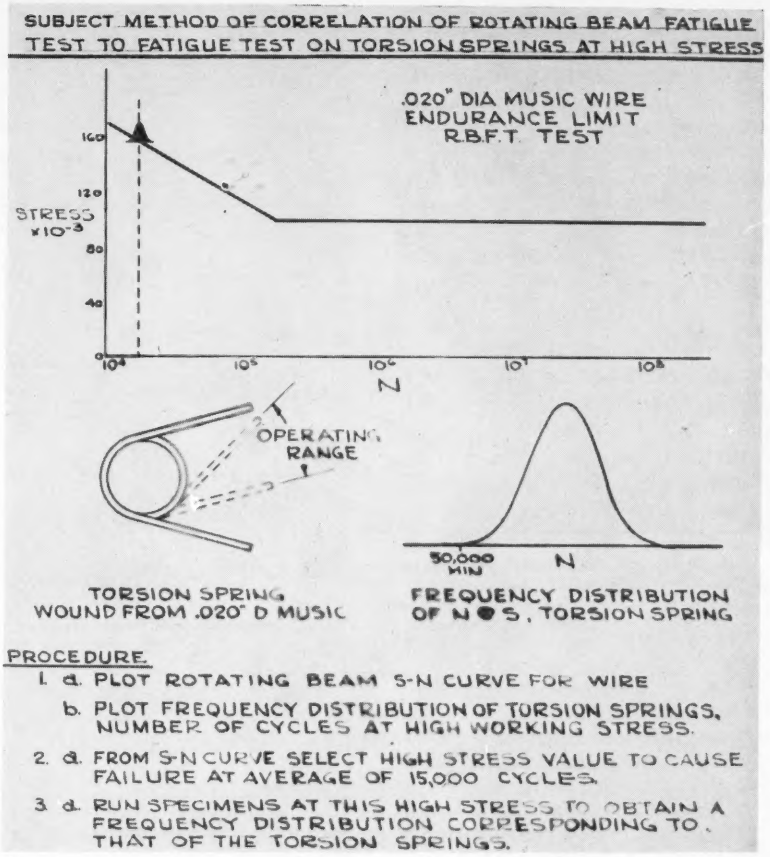

SUBJECT METHOD OF CORRELATION OF ROTATING BEAM FATIGUE TEST TO FATIGUE TEST ON TORSION SPRINGS AT HIGH STRESS
.020" DIA MUSIC WIRE
ENDURANCE LIMIT
R.B.F.T. TEST
STRESS ×10⁻³
160
120
80
40
0
10⁴
10⁵
10⁶
10⁷
10⁸
N
OPERATING RANGE
50,000 MIN
N
TORSION SPRING WOUND FROM .020" D MUSIC
FREQUENCY DISTRIBUTION OF N @ 5, TORSION SPRING
PROCEDURE.
1. a. PLOT ROTATING BEAM S-N CURVE FOR WIRE
b. PLOT FREQUENCY DISTRIBUTION OF TORSION SPRINGS, NUMBER OF CYCLES AT HIGH WORKING STRESS.
2. a. FROM S-N CURVE SELECT HIGH STRESS VALUE TO CAUSE FAILURE AT AVERAGE OF 15,000 CYCLES.
3. a. RUN SPECIMENS AT THIS HIGH STRESS TO OBTAIN A FREQUENCY DISTRIBUTION CORRESPONDING TO THAT OF THE TORSION SPRINGS.

Figure 6.

STATISTICAL REPORT

PRODUCT MUSIC WIRE — CUSTOMER — QUOT. No —
CHARACTERISTIC N @ 5 — PART No — PROD. DEPT. —
INSP. METHOD 23-23 — ORDER No — MACHINE 801
SPECIFIED LIMITS N= 10 M MIN — TEST S = 170,000 — TOOL —
PROCESS LIMITS — INSPECTED BY — H MAX. H MIN.
SAMPLE DRAWN FROM STOCK — N ENDS
WHEN DRAWN TIME DATE — REF. — OD MAX. ID MIN
d

N	LOT NUMBER →	1	2	3	4	5	6
	TENSILE ×10⁻³ →	373	380	382	385	386	382
	STANDARD*						
0							
2,000							
4,000			1				
6,000			111	11			
8,000			11	111			
10,000	1		1111	1111			
12,000	1111 11	1	1111	1111		1	
14,000	1111 1111 111	111	11	111	11	1111	
16,000	1111 1111 1111 1111 1111	1111 111	11	11	1111 1111	1111	
18,000	1111 1111	1111	1	1	1111 1	1111	1
20,000	1111	11			111	11	111
22,000	11	1				11	1111 1111
24,000							111
26,000							1
28,000							11
30,000							

* RESULTS OBTAINED FROM COIL USED FOR MAKING ORIGINAL TEST SPRINGS.

Figure 7.

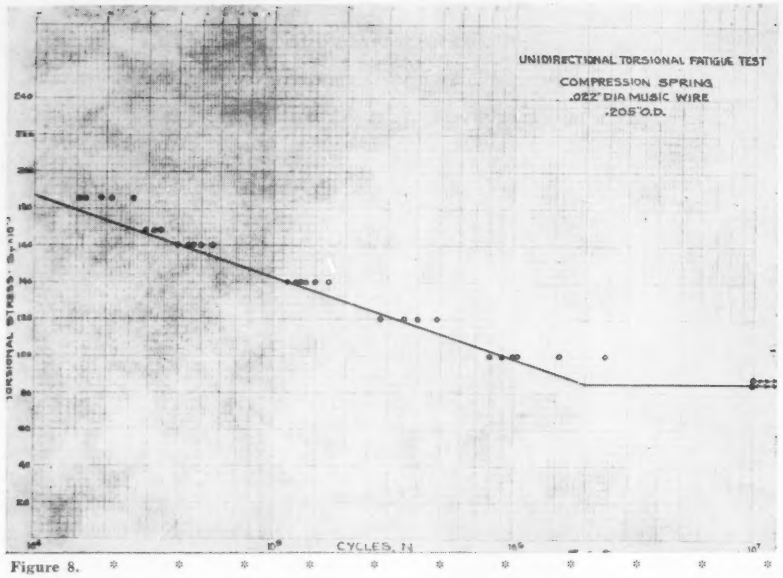


Figure 8.

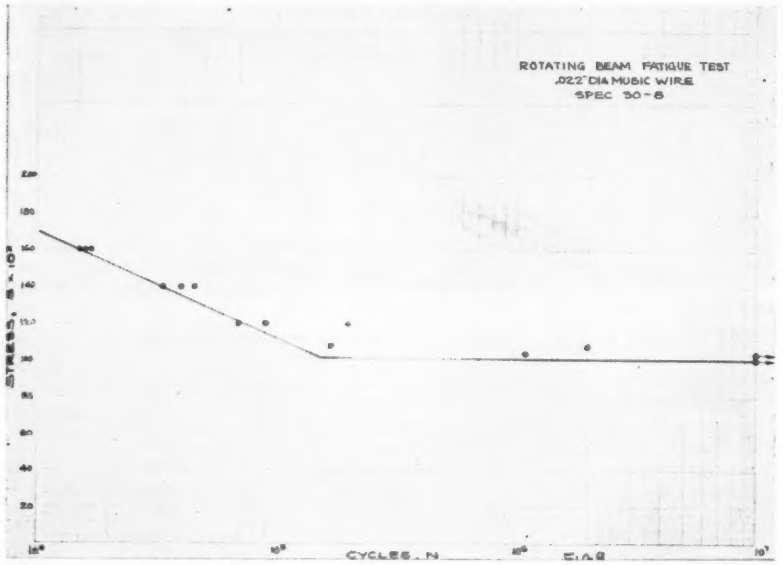


Figure 9.

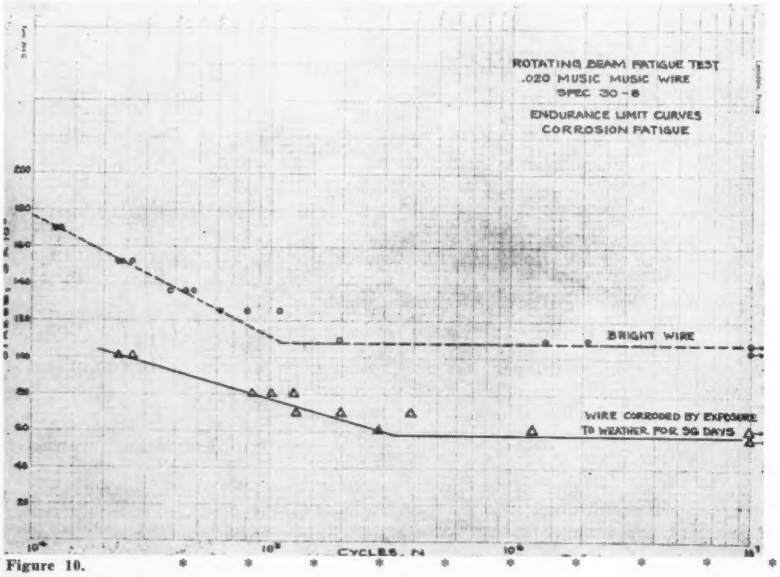


Figure 10.

no close correlation between tensile strength and endurance limit exists and that such an assumption in the design of springs and other wire products can lead to a great deal of trouble.

★ ★ ★

THIS new fatigue testing technique lends itself quite readily to investigations under abnormal conditions such as corrosion fatigue testing or elevated temperature investigations. The segment of the specimen in the region of maximum stress can quite easily be immersed in a corrosive medium or surrounded by a heating element. The effects of nicks and scratches is another type of investigation which might be conducted. The next illustration (Figure 10) shows the effects of corrosion on the endurance limit on samples of .020" diameter music wire. These samples were exposed to the weather for 96 days after which an endurance limit curve was determined and compared with the endurance limit curve of uncorroded samples from the same coil of wire. The endurance limit dropped from 108,000 psi to 58,000 psi.

★ ★ ★

ANOTHER unique and valuable application of this technique is in the use of control charts as a running record of the fatigue characteristics of wire. The illustration (Figure 11) shows a typical control chart for a wire straightening process in which coils of .018" diameter music wire are run through rotary straighteners for use in torsion spring coiling machines.

★ ★ ★

AFTER the straightening operation the wire is coiled on metal reels which are removed from the machine every half hour. At the beginning of each reel a sample of wire is taken by an inspector from which five specimens are fatigue tested at a stress of 170,000 psi. The number of cycles are recorded in each case in accordance with standard statistical methods of plotting control charts. The average value of the number of cycles was found to be 23,000. At point number 35 on the control chart it was noticed that the process was

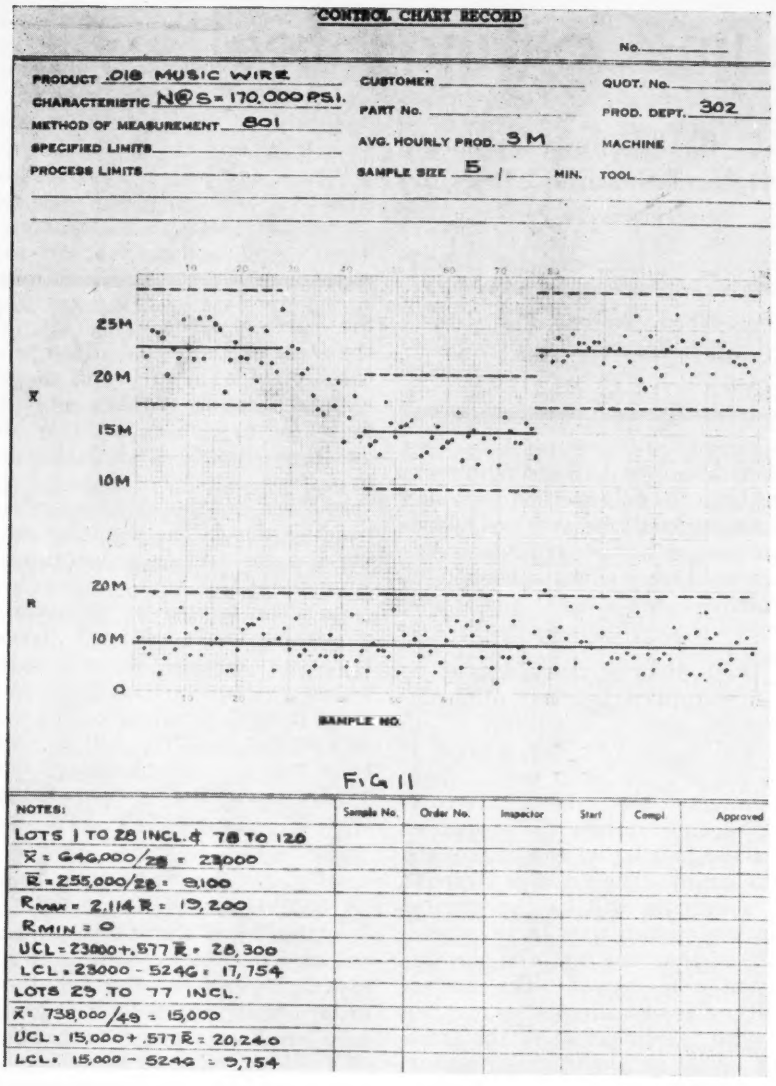


FIG 11

NOTES:	Sample No.	Order No.	Inspector	Start	Compl	Approved
LOTS 1 TO 28 INCL. & 78 TO 120						
$\bar{X}$ = 644,000/28 = 23000						
$\bar{R}$ = 255,000/28 = 9100						
R_{MAX} = 2.114 $\bar{R}$ = 19,200						
R_{MIN} = 0						
UCL = 23000 + .577 $\bar{R}$ = 28,300						
LCL = 23000 - 5246 = 17,754						
LOTS 29 TO 77 INCL.						
$\bar{X}$ = 738,000/49 = 15,000						
UCL = 15,000 + .577 $\bar{R}$ = 20,240						
LCL = 15,000 - 5246 = 9,754						

Figure 11.

* * * * * * * * * *

running out of control and that the fatigue characteristics were becoming inferior until at point 45 the number of cycles was only 15,000. The straightener was shut down at point 77 and it was discovered that one of the straightening dies had worn badly and was producing a line scratch on the wire. The die was replaced and the fatigue qualities of the wire returned immediately to the original high level.

* * *

THIS test suggests a practical means of maintaining a running check on the fatigue characteristics of small diameter wire as it is being produced in the wire mill. A control chart could be plotted for each wire drawing machine and an accurate check kept on the fatigue characteristics of the wire. If any marked decrease occurred in the number of cycles at a fixed stress the wire drawing process could be immediately halted and the cause of the trouble determined. In this way definite control could be exercised on this most important physical property resulting in increased product quality.

* * *

Possibilities for Usefulness

BECAUSE of its simplicity and accuracy the method is ideal as an inspection tool. With a bank of five of these machines, for instance, an inspector with very little experience could set-up and test at high stress five samples in the space of ten minutes. Because of the linearity of the dimensions the errors involved would be quite small.

* * *

MANY experimental investigations into the fatigue characteristics of spring materials have been run at Hunter Spring Company which suggest other opportunities for use of the apparatus in research work. In one case the effect of electroplating on fatigue life was studied—in another heat treatment effects were investigated.

* * *

IT is felt, however, that the most far-reaching value of more rapid fatigue testing can be in terms of acceptance testing and inspecting. Dimensional checking, load checking and all manner of quality testing today is being done more and more by statistical methods, employing the frequency distribution curve and the control chart. Perhaps the fatigue testing of small wire will soon enter the same domain.

* * *

TO WIRE MILL MEN

Have you considered joining the Wire Association? You are cordially invited to become a member. Dues are $15.00 a year, which includes a subscription to WIRE & WIRE PRODUCTS and a copy of the Annual Buyers Guide.

THE WIRE ASSOCIATION

300 MAIN STREET STAMFORD, CONN.

Aluminum Coating Steel

By C. B. Ulshafer, Metallurgist,
Hughesville Machine & Tool Co.,
Hughesville, Pa.

A paper presented at the Wire Association Convention at Pittsburgh, Pa., October, 1948.

THE coating of steel with other metals to promote corrosion-resistance has been practiced for many years. The principal metals used have been tin, lead, zinc, nickel, silver, copper, etc. Aluminum, a material offering many advantages has resisted all efforts toward commercial utilization as a coating material until comparatively recently.

★ ★ ★

ABOUT ten years ago a number of researchers who appreciated the value of aluminum as a coating material began to apply for letters patent on various processes designed to overcome the difficulties encountered in its application. Near the same time experiments were also being carried out toward the same end in France, Germany, and Russia.

★ ★ ★

COATING steel by the use of a metal spray gun, one of the methods investigated, produces no bond of any consequence between the dissimilar metals. As a result coatings produced by this method are loosely adherent and cannot withstand subsequent working or forming, nor can they be expected to be satisfactory under service.

★ ★ ★

ANOTHER method which has received consideration is that of electrolysis. Since a salt solution molten below the melting point of aluminum must be used, no diffusion or bonding zone occurs. As a result the covering is again merely a very thin envelope over the iron base and is not adherent. Attempts to enforce adherence by supplementary annealing have only resulted in blisters.

★ ★ ★

APPLICATION by dipping the steel wire or parts to be coated in a molten bath of aluminum has been the only method by which a coating could be obtained which has been adherent and which has possessed the advantages sought after.

★ ★ ★

FOUR distinct zones appear to be formed; namely, the unchanged steel, a thin layer of Al_3Fe and Al_2Fe (Al_5Fe_2), a layer of Al_3Fe, and the outer coat of pure aluminum. The value of the coating depends on how the properties of these four layers can be brought into accord. The cleavage strength or adherence will be the greater the less disturbance to the structure of the base material the diffusion zone causes. The malleability of the coating varies inversely with the thickness of the bonding layers of aluminum-iron-alloy. Corrosion-resistance and chemical stability depend on the purity of the outer aluminum coat. In general the shorter the length of dip and the lower the temperature at which it is carried out, the more satisfactory the coating that may be expected. (1)

★ ★ ★

ONE of the earliest successful methods of hot dipping with Aluminum is that developed by **Dr. Colin G. Fink** of Columbia University. His procedure consisted of packing the steel wire to be coated with hydrogen by passing same thru a furnace at approximately 1800°F. The wire was then cooled to approximately 1300° and immediately introduced into the molten aluminum bath through a restricted nozzle projecting below the surface. The prepacking of the steel at the elevated temperatures provides a supply of atomic hydrogen having a far greater affinity for oxygen than Aluminum and thus eliminates all oxides and impurities which discourage the formation of the Aluminum-Iron bonding alloy. The resultant coating has the silvery appearance of Aluminum and very good adherence. The temper of the wire is moderately soft. Should harder tempers be desired they may be obtained by coating larger wire and subsequently drawing to the size and temper required. (2) The material may be worked without danger from cracking up to an elongation of approximately 25%.

★ ★ ★

ANOTHER slightly differing method is that developed and patented by **Tadeusz Sendzimir** and used by a prominent firm for aluminizing sheet and strip. The procedure involves, first, the oxidation of the steel wire to be coated by traversing a furnace maintained at an annealing temperature of approximately 1550 to 1600°F. After a uniform layer of oxide has been formed the wire is conducted into another furnace with a controlled reducing atmosphere. Here the thin oxide layer formed in the preceding step is reduced again to metallic iron. A thin layer of freshly reduced material of a different metallographical construction is formed. This altered structure is characterized by a strong tendency to amalgamate with the coating metal. A further reduction in temperature to approximately 1300°F is carried out and, still in a reducing atmosphere, the wire is led beneath the surface of the coating bath. (3) With a bath temperature of approximately 1275°F and an immersion time of

one second, a coating thickness of approximately .0012″ of Aluminum and .0003″ of Al_3Fe is obtained. Longer periods of immersion increase the thickness of the bonding layer irrespective of temperature. Higher temperatures decrease the thickness of pure aluminum and increase the thickness of the bonding layer. (4) After emergence from the coating bath, treatment is very similar to that employed in galvanizing.

★ ★ ★

STILL another process is that described by the Frenchman **M. Michel Alferieff** in La Technique Moderne. The essential points of his method are as follows: (One) The material to be coated is subjected to an annealing heat treatment at approximately 1600° F in an artificial atmosphere, the composition and effect of which vary according to the various functions to be carried out during the operation. (Two) While passing through this atmosphere the temperature of the steel rises to the annealing temperature, is held at that point, and is then plunged into the bath of molten aluminum after being cooled, prior to plunging, to a temperature strictly equal to that of the bath. (Three) The steel wire is treated in the presence of a mixture of nitrogen and hydrogen admitted to the furnace such that its movement is opposite to that of the wire. An adjusted quantity of steam and hydrogen is added by a separate port to this gas mixture. This artificial atmosphere, with its three components carefully adjusted, has an oxidizing effect during the passage of the steel wire through the rising temperature zone immediately after the point of furnace entry. This oxidation facilitates later phases of the operation by increasing the coefficient of heat radiation of the treated steel. Further, the mixture has a reducing and decarburizing effect in the high temperature zone near the center of the furnace. This provides the steel with a metallurgically clean surface prior to immersion in the coating bath. Finally, it has a neutral effect during the cooling period as the wire approaches the exit end of the furnace just prior to immersion. At this lower temperature the partial pressure of hydrogen becomes lower allowing release of the hydrogen absorbed by the steel during earlier phases of the treatment, thus making negligible the harmful effect of the absorption of this gas.

★ ★ ★

THE only essential requirement for successfully bonding aluminum to steel is that the union be favored by a steel surface free from oxygen, oxides, carbon, sulphur, or other impurities, (5) The above-described three methods all accomplish this result by the use of hydrogen under various conditions. Patents which have been granted seem to conflict with each other to a large extent in describing differently that which is essentially the same claim; namely, the purification and elimination from the steel surface of any impurities interfering with the formation of the aluminum-iron bond by the use of hydrogen, either by itself or as a component of a reducing atmosphere at an elevated temperature.

★ ★ ★

MUCH of the work done has been of an experimental nature. Consequently, little data of a practical nature is available for publication, most of it, having been acquired the expensive way, is tucked away in the secret files of the experimenters. Considerable further work will be necessary in order to make a luminizing entirely successful commercially. Several variations of the described methods are now being investigated by different firms and individuals. In some cases the results of their work will become available at a later date. At the present time there is little more to offer.

★ ★ ★

THE use of aluminum as a coating material is favored, among other ways, by its low cost and by its almost unlimited availability. Further, it is superior in nearly every way to its closest competitor, zinc. The corrosion-resistance of zinc-coated material is limited largely to that type of corrosion induced by the atmosphere. Aluminum adds to this, protection against all but the strongest acids, protection against oxidation at both high and low temperatures. and, although attacked, resistance to salt spray and alkaline conditions.

★ ★ ★

AMONG the new uses opened to coated wire by aluminum which formerly demanded expensive alloys are those involving an elevated temperature. Aluminum coating offers almost complete resistance to oxidation of the base metal at temperatures up to 1600° F. Failure only begins to take place at approximately 1800° F. This property is due to the excellent stability at high temperatures of the aluminum-iron alloys which form the bond. As the temperature increases the alloying of the aluminum and iron proceeds until the entire coating is of this heat-resisting material. (6)

★ ★ ★

AFTER a coating has been applied, aluminum may be cast over the steel core with perfect adherence, either for the purpose of furnishing a much heavier proportion of aluminum for subsequent reduction by drawing or other means, or, for the addition of other shapes to the base. Fabrication may be carried out by brazing in the same manner as that employed with solid aluminum. Joints may be brazed with the use of aluminum powder or paste, retaining all the corrosion-resistance of the original coated material. (7)

★ ★ ★

A MARKET is ready and waiting for the commercial advent of aluminum coated steel. It stands ready to supplant a host of lesser able coatings in accepted uses as well as establish a field for itself.

REFERENCES

(1) Wolfgang Seith and Christoph Ochsenfarth—Zeitschrift fur Metallkunde, Vol. 35, 1943.
(2) Dr. Colin G. Fink—Wire and Wire Products, October, 1938; U. S. Patent No. 2,082,622—1937.
(3) T. Sendzimir—U. S. Patent No. 2,110,893, March 15, 1948.
(4) Dr. Armand DiGiulio — Wire and Wire Products, August 1948.
(5) M. Michel Alferieff — La Technique Moderne, Vol. 35, Nos. 21 & 22, 1st and 15th November, 1943.
(6) A. S. Russell—Nature, July 25, 1936.
(7) M. G. Whitfield and V. Sheshunoff —Iron Age, July 1, 1948.

★ ★ ★

Evaluation of Pickling Inhibitors from the Standpoint of Hydrogen Embrittlement

By C. A. Zapffe and M. E. Haslem
Consulting Metallurgist Research Chemist
Baltimore, Md.

III. CONDITIONS OF CATHODIC PICKLING*

SUMMARY

THIRD in a series of papers studying the pickling brittleness of both mild and stainless steel in sulfuric acid in relationship to the presence of commercial pickling inhibitors, the present study concerns tests conducted under the conditions of cathodic pickling. The variable of metal attack is thereby eliminated, the production of hydrogen on the metal surface is controlled, and any polar or ionic constituents of the inhibitor come under the influence of an electric field.

★ ★ ★

OF THE numerous reagents tested, most of them by their presence in the sulfuric acid electrolyte increase embrittlement both for mild steel and for stainless steel. A very few inhibit embrittlement for mild steel; none for stainless steel.

★ ★ ★

COMPARING the results with those previously obtained for the same steels and same reagents under conditions of acid pickling, one finds interesting interrelationships which may point the way toward solving aspects of pickling inhibitors raised in this work, and in addition indicate promising avenues for research in disclosing the physicochemical principles which so strongly operate to produce these results.

INTRODUCTION

IN TWO previous papers [1, 2], a comprehensive group of commercial pickling inhibitors was studied from the standpoint of hydrogen embrittlement developing during the pickling of stainless steel and mild steel, respectively, in sulfuric acid.

★ ★ ★

AMONG several issues raised by the surprising results of that research, one of particular fundamental interest concerns an unidentified principle of surface chemistry which allows hydrogen to be absorbed by the metal quite irrespective of the degree of metal attack. That is, with mild steel, the presence of the various inhibitors in the pickling solution results in widely differing effects upon embrittlement, regardless of uniformly decreased metal attack; and, in the pickling of stainless steel, it is the rule for the inhibitor to **increase** embrittlement even beyond that caused by the raw acid itself—and this also in the face of greatly decreased metal attack.

★ ★ ★

UNDER conditions of cathodic pickling, metal attack virtually vanishes as a factor; and the delivery of hydrogen to the metal surface can be held constant from test to test by fixing the current density. Cathodic pickling therefore provides a control of certain important factors which are more or less uncontrolled in acid pickling. In addition, the presence of an electric field may influence the behavior of the polarized or ionized molecular constituents of the inhibitor in a manner which could lead to useful disclosures.

★ ★ ★

IN THE present paper, the commercial reagents previously studied under conditions of acid pickling are reexamined as additions in cathodic electrolysis, with both mild steel and stainless steel serving as cathode.

Experimental Procedure

AS IN THE foregoing studies, the constant-rate single-bend test was used for determining the degree of embrittlement on the basis of the angle of bend that an 0.06-in. diam. wire would sustain after a given treatment. A typical mild steel, SAE 1020, and a typically sensitive stainless steel, AISI Type 440-C (17% chromium—1% carbon) served as standard specimens. In addition, Types 410 (12% chromium) and 431 (16% chromium—2% nickel) stainless steels were also used in auxiliary tests. Detailed description of all four steels can be found in the first paper of this series [1].

★ ★ ★

FOR the electrolyte, the same 10% by volume H^2 SO^4 was used as in the tests with acid pickling. A 200-cc. portion was made from distilled water and c.p. acid, renewed for each test. Current density was fixed at 1 amp./in.^{2}; charging time at 15 minutes, as for the acid pickling; temperature at 77°C (170°F) as before. In other words, the experimental conditions were identical with those of the foregoing research except that the solution is now used as an electrolyte. The circuit potential was impressed previous to immersion of the duplicate cathode wires, thus preventing any acid attack which might interfere with the results.

Paper III, herewith, last of the series. Paper I was published in the October, 1948 Issue and Paper II in the November, 1948 Issue of WIRE AND WIRE PRODUCTS.

*Research conducted in the laboratory of the senior author in conjunction with a fundamental study of gas-metal systems sponsored by the Office of Naval Research.

IN THE first paper*, a listing of the inhibitors can be found. Here they will be referred to only as Reagent I, II, III, etc. On the left of each graph, along the ordinate, will be found the "blank" bend value which represents cathodizing in the absence of any inhibitor. Large and small circles represent the duplicate specimens; empty circles refer to stainless steel, filled circles to mild steel; and as the points move to the right they disclose the effect of the reagent upon the angle of bend. For purposes of ready visual interpretation, the change in embrittlement is indicated as a shaded area based upon the "blank" angle of bend.

* * *

Results

EVEN more spectacular than the data for the acid pickling of stainless steel, the present tests disclose a vast range in the activities of the various inhibitors under conditions of cathodic pickling—for the most part injurious.

* * *

AGAIN, three classifications can be assigned having useful distinction:

I. **Reagents which increase embrittlement of both mild steel and stainless steel**
II. **Reagents which increase embrittlement of mild steel, but have no effect on stainless steel**
III. **Reagents which prevent embrittlement of mild steel, but have no effect on stainless steel**

★ ★ ★

AS FOR the stainless steel itself, there are only two classifications:

A) **Reagents which increase embrittlement**
B) **Reagents which have no effect**

★ ★ ★

NONE inhibits embrittlement. Even Reagent IX, which showed some slight improvement in the tests with acid pickling, does no better now than to leave the blank angle of bend unaltered.

★ ★ ★

OF ALL effects, those on the mild steel are most varied; and the frequent divergence between the behaviors of mild steel and stainless steel in the same electrolyte must hold some clue to the principles controlling the absorption of hydrogen.

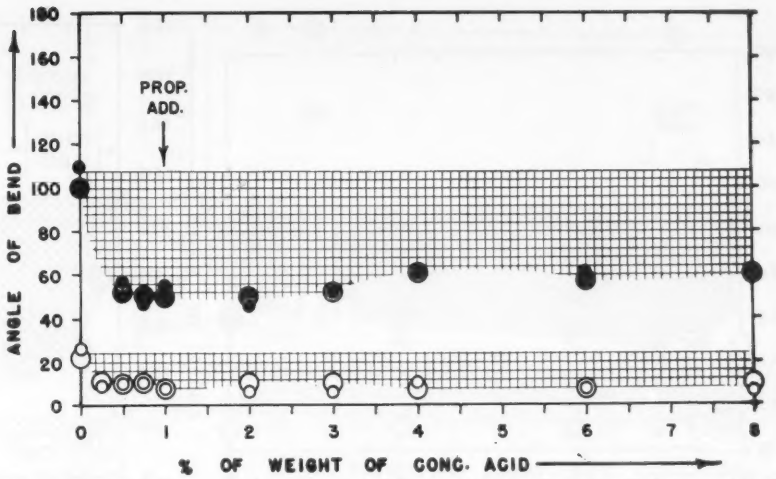


Figure 1.—Behavior of Reagent I, showing a marked increase in embrittlement for both types of steel.

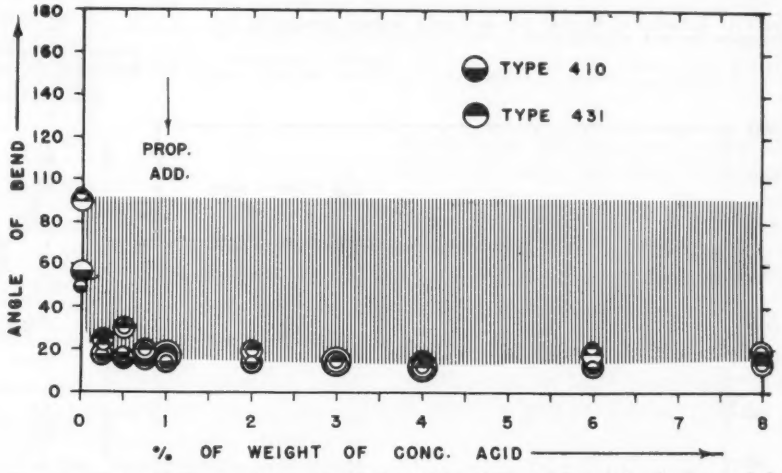


Figure 2.—Tests with Reagent I repeated with Types 410 and 431 stainless steels, showing marked increase in embrittlement. * * * * * * * * *

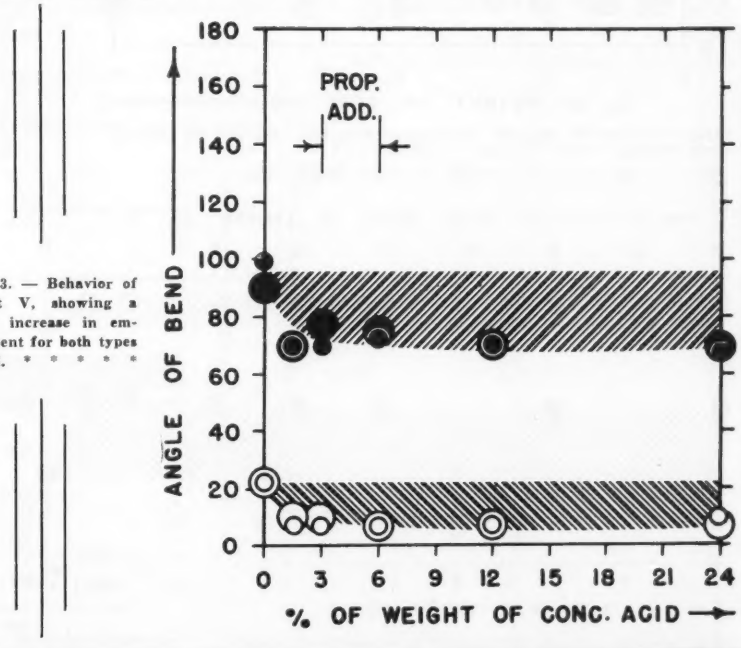


Figure 3. — Behavior of Reagent V, showing a marked increase in embrittlement for both types of steel. * * * * *

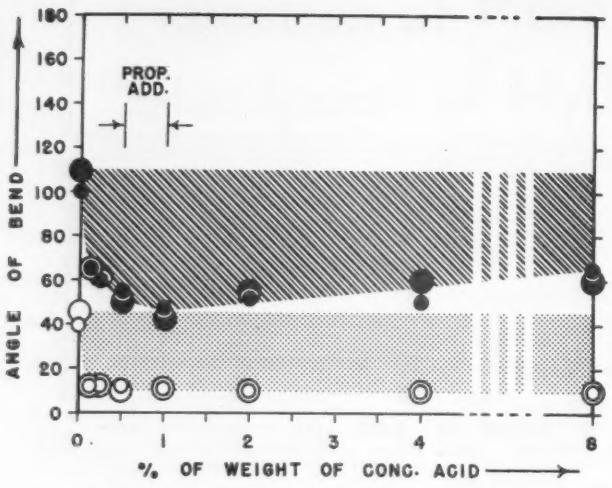


Figure 4.—Behavior of Reagent VI, showing a marked increase in embrittlement for both types of steel.

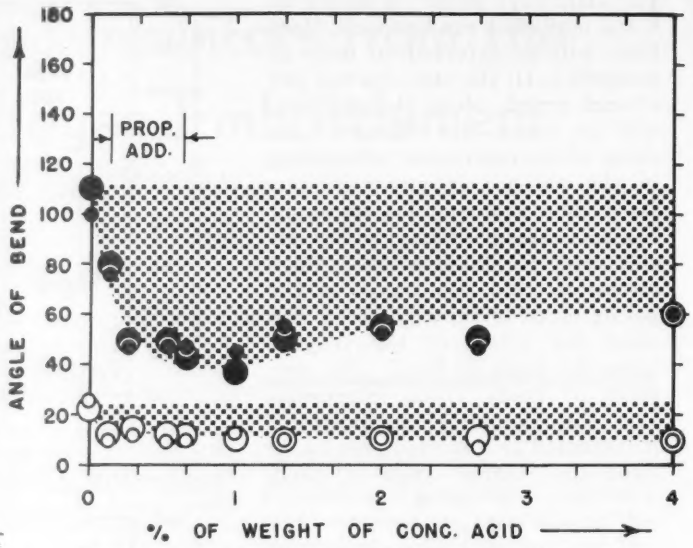


Figure 5.—Behavior of Reagent VII, showing a marked increase in embrittlement for both types of steel.

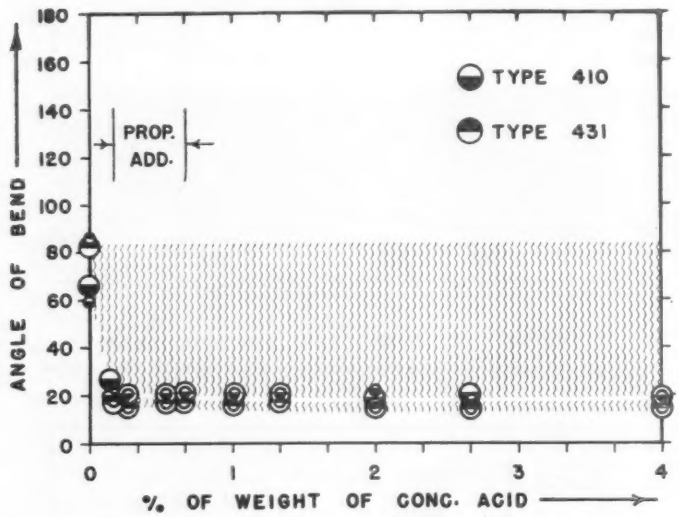


Figure 6.—Tests with Reagent VII repeated with Types 410 and 431 stainless steels, showing marked increase in embrittlement.

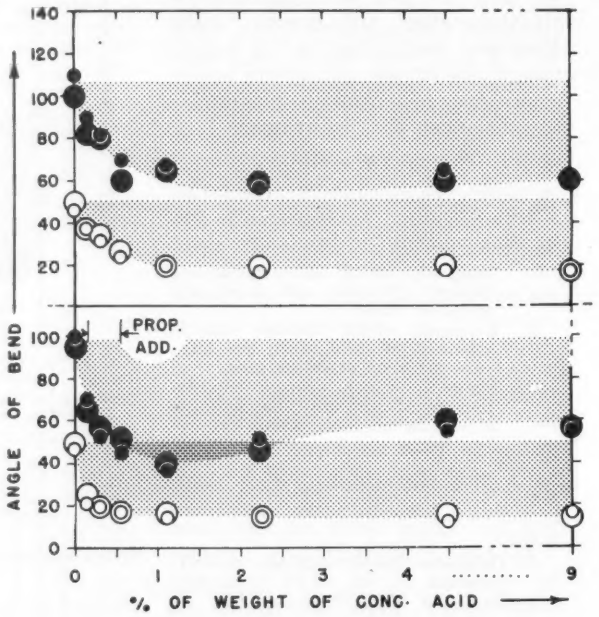


Figure 7.—Behavior of Reagent VIII (above), and Reagent X (below), showing a marked increase in embrittlement for both types of steel.

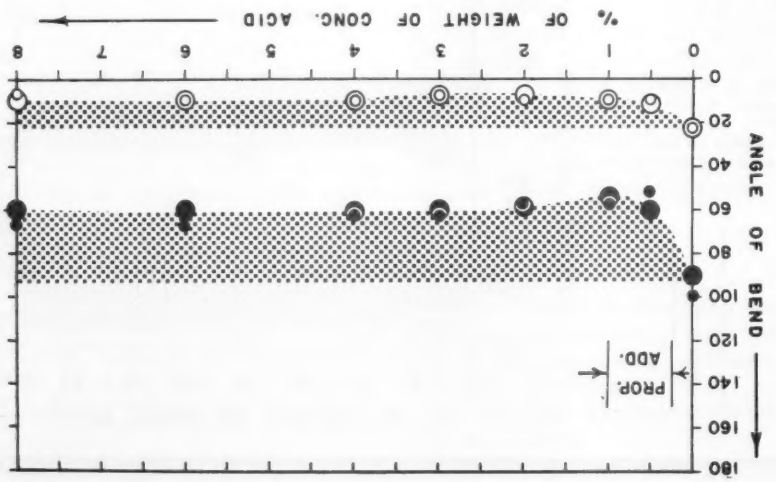


Figure 8.—Behavior of Reagent XI, showing increase in embrittlement for both types of steel.

Reagents Which Increase Embrittlement of Both Mild Steel and Stainless Steel

OF SIXTEEN reagents studied, eleven caused a marked increase in embrittlement for both mild steel and stainless steel. That means that the 15-minute cathodizing treatment caused greater amounts of hydrogen to be ab-

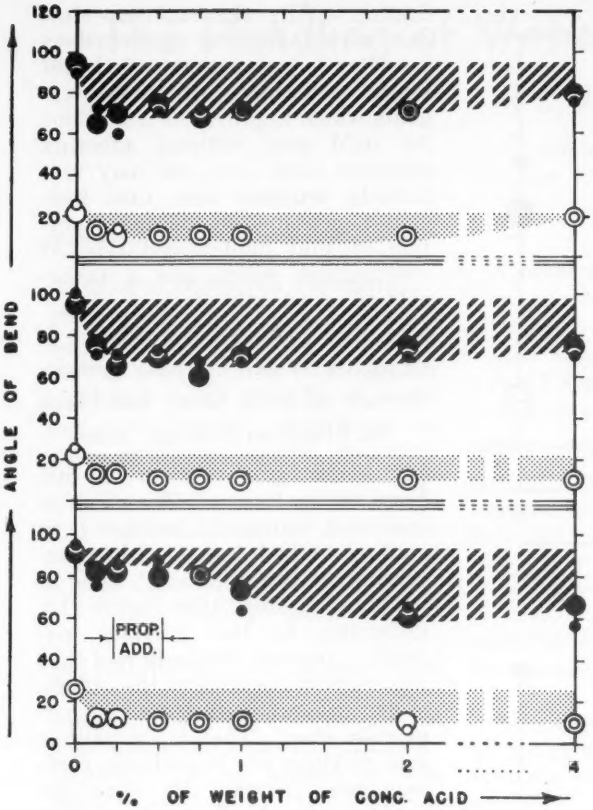


Figure 9.—Behavior of Reagent XII (top), Reagent XIII, (center) and Reagent XIV (bottom) showing increase in embrittlement for both types of steel. (Left) *

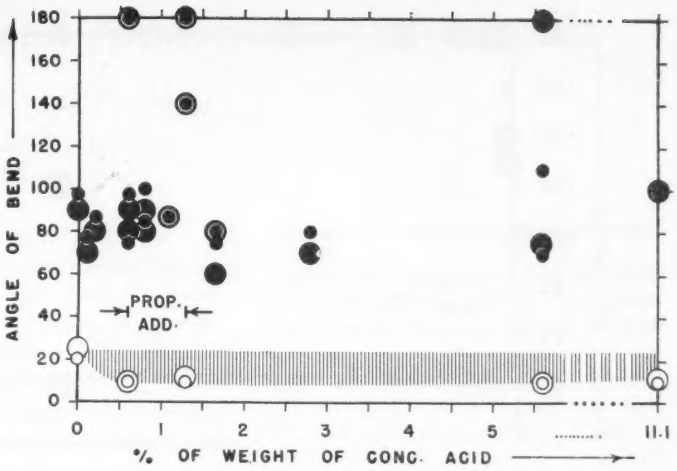


Figure 10.—Behavior of Reagent II, showing the customary increase in embrittlement of the stainless steel, but an anomalous activity with mild steel. (Above) *

sorbed by mild steel and stainless steel alike, when one of these reagents was present.

★ ★ ★

IN Figure 1, Reagent I typifies this group. The proprietary concentration for acid pickling is indicated to serve as a point of reference. Note that the ductility of both steels rapidly decreases as the reagent is added.

★ ★ ★

N Figure 2, these tests with Reagent I are repeated using two other grades of stainless steel, Types 410 and 431. The same activity discloses itself, only now even more prominently, the angle of bend for both steels being reduced to extremely low values.

★ ★ ★

IN passing, attention will be called to the fact that in the acid pickling of these two latter steels the blank was 180 degrees. Only in inhibited acid did they evidence embrittlement. Here, where the hydrogen is supplied electrically, embrittlement shows itself already in the blank, which is then further reduced by the addition of the inhibitor. These differences between acid and cathodic pickling of the stainless steels have been described at some length previously [3,4].

★ ★ ★

REAGENT V in Figure 3, referring again to the standard steels, shows increased embrittlement for both sets of tests.

★ ★ ★

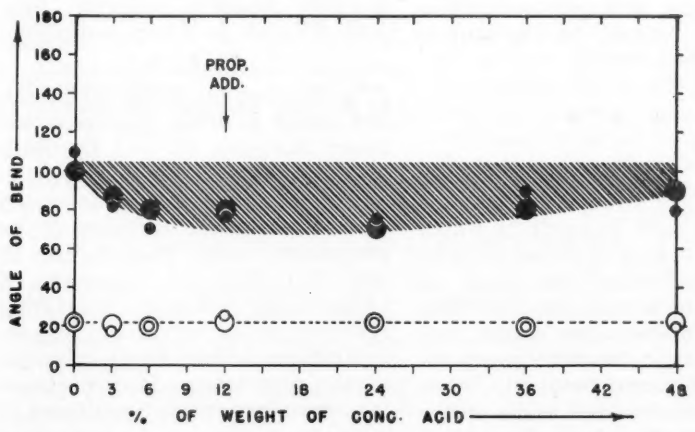


Figure 11.—Behavior of Reagent IV, showing an increase in the embrittlement of mild steel, but accompanied somewhat unexpectedly by a lack of any effect on stainless steel. * * * * * * * * * *

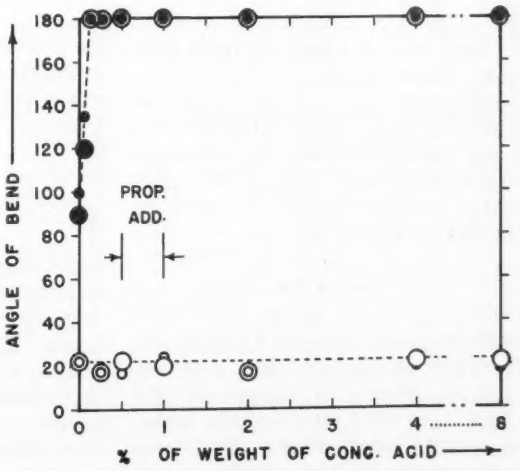


Figure 12.—Behavior of Reagent III, showing complete inhibition of embrittlement of mild steel, but no effect on stainless steel. * * * * * * * * * *

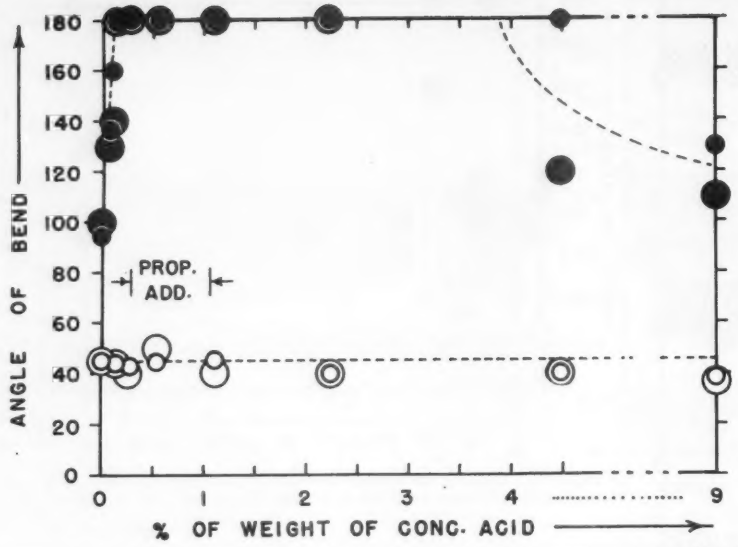


Figure 13.—Behavior of Reagent IX, showing complete inhibition of embrittlement of mild steel, but no effect on stainless steel. A reversion to slight embrittlement occurs at concentrations several times greater than the proprietary.

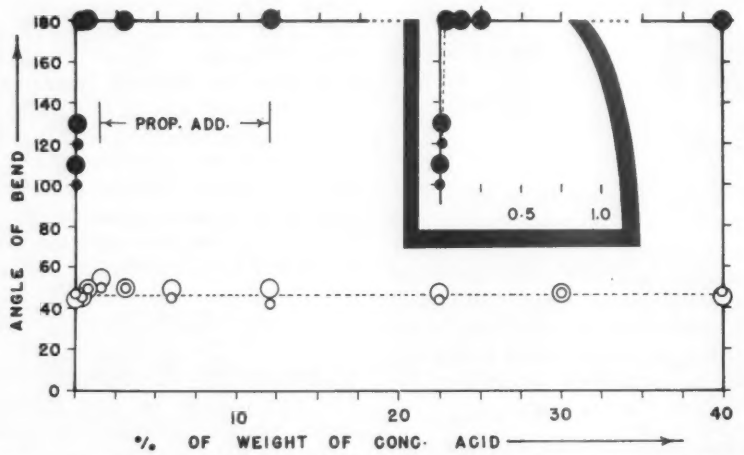


Figure 14.—Behavior of the specially designed inhibitor, Reagent XV, showing an extremely effective inhibition of embrittlement for mild steel, though still having no effect on stainless steel.

IN Figure 4, Reagent VI shows a very strong effect, as does Reagent VII in Figure 5. For further verification of these injurious behaviors, tests with Reagent VII were repeated using the alternate stainless steels, Types 410 and 431. Similar injury is strongly shown in Figure 6.

★ ★ ★

IN Figures 7 and 8, Reagents VIII, X, and XI are depicted; and in Figure 9, Reagents XII, XIII, and XIV. With these latter, embrittlement of the mild steel seems increased to a lesser extent than for most of the preceding. In fact, Reagent XIV provides only a negligible increase in its proprietary range.

★ ★ ★

FINALLY, in Figure 10 we see a strange mixture of data for mild steel with Reagent II which cannot be judged as either increasing or decreasing the angle of bend. This is the only inhibitor giving such anomalous results, and it is classed in the first group because of its unpredictability. Also, the decrease in bend angle of the stainless steel confirms this classification. Why the stainless steel does not also disclose an anomalous behavior is not understood. Later figures, however, will show reagents which improve the conditions for mild steel without affecting stainless steel; and one may tentatively conclude here that Reagent II contains an indecisive portion of that unidentified type of constitutent which has a favorable effect on mild steel.

★ ★ ★

Reagents Which Increase Embrittlement of Mild Steel, but Have No Effect on Stainless Steel

IN this category there is only one inhibitor, Reagent IV, which is separated principally because it is unusual to find greater injury occurring to the mild steel than to the stainless steel. (See Figure 11.) Referring to the previous papers [1, 2], one will similarly find that this reagent, relative to the others, is more favorable to stainless than to mild steel. That is, in neither acid pickling nor in cathodic pickling does Reagent IV alter the angle of bend of stainless steel from that of the uninhibited test, which at least frees it from the common objection of increasing embrittlement. With mild steel, however, it is in the class of least acceptable inhibitors both for acid pickling and for cathodic pickling.

★ ★ ★

Reagents Which Prevent Embrittlement of Mild Steel, but Have No Effect on Stainless Steel

ONLY two marketed inhibitors, Reagents III and IX, plus the specially designed inhibitor, Reagent XV, fall in this classification.

★ ★ ★

OF the two marketed inhibitors, there is little to choose between Reagents III and IX. Both cause rapid inhibition of embrittlement, with prevention occurring safely short of the minimum of the proprietary range. (See Figures 12 and 13.) However, Reagent IX (Figure 13) incurs an interesting reversion to embrittlement at concentrations several times in excess of the proprietary. Perhaps there is a secondary minor constituent in

(*Please turn to page* 1172)

The Handling of Webs and Monofilament Materials

By C. A. Litzler, President
Industrial Ovens, Inc.
Cleveland, Ohio

PART II.

A paper presented at the American Society of Tool Engineers Semi-Annual Meeting at Boston, Mass. in October, 1947.
Part I appeared in the November issue of Wire and Wire Products.

Strand Materials Handling

EMPIRICALLY it can be stated, that what has just been said of web material handling can be applied to the handling of strand or monofilament materials. In some processes, strand materials are more difficult to handle than webs, primarily due to the small cross-sectional area at the lower net tension values allowable on the strand material.

* * *

NATURALLY, it is less of a mechanical problem to wind .006"x48" wide paper than it is to handle a strand material with .008" diameter. Some phases of the problem are similar but essentially speed and tension control must be more sensitive and more quickly responsive.

* * *

SINCE the major reason for the handling of any material is to process it, let us consider the problem in reverse and analyze what processes involve the handling of strand materials.

* * *

PRINCIPALLY, strand materials must be handled to accomplish any one of the following operations:

1. Extrusion forming such as drawing of plastic tubing.
2. Extrusion jacketing such as wire or cord jacketing with thermoplastic material.
3. Dipping impregnation or coating such as in cable lacquering or V-belt cord or glass cord impregnation.

* * *

ALL three fundamental operations have similar requirements of speed and tension control, as in web material. The need for accuracy in handling equipment varies in direct proportion to the ultimate breaking strength of the material. The need in this case might be stated in terms of the complexity of control and drive equipment. This is still another way of expressing the relative cost of equipment to accomplish a given processing operation.

* * *

To return to our basic operation as the extrusion forming of strand material such as polyvinyl tubing we refer to Figure No. 9.

* * *

IN this operation, which is the extrusion of plastic tubing, many basic and precise elements are involved. They include an extrusion machine for thermoplastic extrusion, water cooling bath, a constant speed, water submerged, capstan unit, a tensioning device and a synchronized windup machine. Here are embodied the same problems as previously mentioned, but in a higher order.

* * *

THE screw type extrusion machine delivers a definite volume of heated thermoplastic material per minute for a given tubing or rod size. Because of that fact, the extruded material must be drawn from the extruding die at a speed commensurate with the solid volume of the tube or monofilament to be extruded.

* * *

THUS, close speed and tension control are necessary to maintain wall thickness or tubing diameter. In this operation, the capstan pulls the material from the die head at a uniform rate. The tensioning device and the winding machine must all operate synchronously with the capstan and within uniform constant tension rates, or the wall thickness or the diameter of the material will suffer. The tension control equipment must be very sensitive and responsive and the windup machine must very smoothly decelerate the windup reel at a very low tension value.

* * *

IN this system, there are the same basic components as the web system, that is, the capstan or pull rolls, treating equipment, tensioning devices and windup drive. Here, also, grooved handling sheaves are used in place of fabric rolls. Any of the constant tension variable speed drives previously discussed could be used.

* * *

THERE is another important handling operation in conjunction with the extrusion process. Perhaps the largest number of strand handling extrusion systems is not for the forming of tubing as just mentioned, but the jacketing of wire, cord, rope, etc., with plastic jacketing materials such as polyvinyl chloride, rubber, nylon, polyethylene. Final use of the material is electrical wires, cable, plastic clothesline and upholstering beading, etc.

* * *

Continuous Strand Handling—Extrusion

A HIGH speed constant tension continuous handling system used to accomplish this operation is shown in Figure No. 10.

* * *

IN high speed handling systems of this type there is a choice of system drives as in web materials. Either mechanical, hydraulic, variable voltage, fluid hydraulic or electronically controlled drives are used. Each type of drive has its

particular application. Because of the wide speed range and the precise tension control a fluid hydraulic system has a relative advantage. Despite this fact, however, there are very many variable voltage drives in operation.

★ ★ ★

GENERALLY the hydraulic drive system operates as follows: The insulating machine screw is operated by means of a fixed displacement pump which is speed and torque controlled by the oil flow developed by a variable displacement main pump. The fixed displacement motor is sensitive to variable oil volumes and operates with matched speed charactertics to the variable displacement motor delivery. Using the speed from the fixed displacement tuber drive, a second variable displacement pump is driven directly therefrom. The second variable pump delivers metered oil flow to the fixed displacement motor driving the capstan, which must operate synchronously with respect to the tuber stock screw. By its own variable displacement control, it is possible to alter the capstan speed without disturbing the over-all speed synchronization.

★ ★ ★

AFTER being propelled by the capstan, the strand is passed to the winding machine. On the high speed systems, two windup reels are used. The drive from these reels normally is constant tension variable speed drive, and accordingly must be driven from a convenient, synchronized power source.

★ ★ ★

BECAUSE the speed of the windup reels is synchronous with the capstan speed, that hydraulic system is used. By utilizing the flow of discharged oil from the main capstan drive we have a metered volume of oil to drive the fluid motors driving the windup reel. This fluid motor is of a fixed displacement type. To control the speed of the windup reel with respect to the diameter buildup, a float sheave stand is used. The displacement of this free moving sheave is again used to operate the required flow control or relief valves. The position of the tension sheave determines the amount of oil that is delivered to the fixed displacement of the motor driving the windup reels.

★ ★ ★

BY OPERATING on a higher fluid pressure, and with several other minor changes, the drive for the windup machine can become a constant pressure or horsepower drive. This deletes the dancer sheave and substitutes additional pressure control valving in the lines delivering fluid pressure to the windup drive. When running file wire, cord or strand at a very low tension, the unwinding stand can be driven by fluid motors, synchronously with the main wire speed throughout the entire system. By so doing, the strand that is being coated does not have the additional tension load of the inertia of the unwind reel. Likewise, the complete acceleration and deceleration of the entire system can be conveniently accomplished without breaking the strands or backlash or tangle of the unwinding material.

★ ★ ★

THE two extrusion drives just mentioned serve to illustrate two typical handling problems for two kinds of monofilaments for strand material, through their most common operation, forming and jacketing.

★ ★ ★

Dip Coating

ONE more basic handling method is to be considered. That is the handling of continuous strand or monofilament materials through progressive dipping or saturating operations. Several basic methods are in use. However, the one shown in Figure No. 11 is the most flexible and compact with respect to the equipment as follows.

★ ★ ★

THIS illustration shows the passage of a strand from the letoff reel, through a multi-dip coating operation and thence to the capstan and windup reel stand. It principally illustrates the arrangement of wire handling through a vertical drying tower after each successive coating pass. Note the successive advancement of the strand continuously from first to succeeding coating passes.

★ ★ ★

IT SHOWS the general relationship of the bath and top sheaves, the coating pots, the bottom sheaves and the drying tower. Primarily, the main purpose of multiple dipping systems is the application of thin coating to strand materials. These thin coatings are applied in a number of separate passes, with a drying operation immediately after each dip coating. In other words, it is a thin laminated coating applied successively to strand materials. Because of the number of passes involved, and the normal frictional losses in the large number of sheaves usually required, special attention must be paid to the method employed in driving the strand.

★ ★ ★

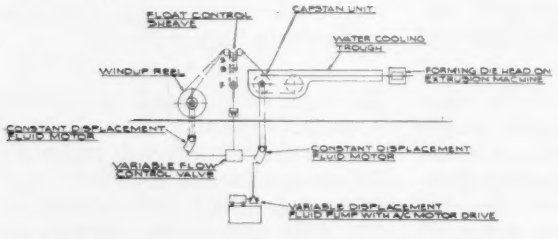

FLOAT CONTROL SHEAVE
CAPSTAN UNIT
WATER COOLING TROUGH
WINDUP REEL
FORMING DIE HEAD ON EXTRUSION MACHINE
CONSTANT DISPLACEMENT FLUID MOTOR
VARIABLE FLOW CONTROL VALVE
CONSTANT DISPLACEMENT FLUID MOTOR
VARIABLE DISPLACEMENT FLUID PUMP WITH A/C MOTOR DRIVE

Figure 9.

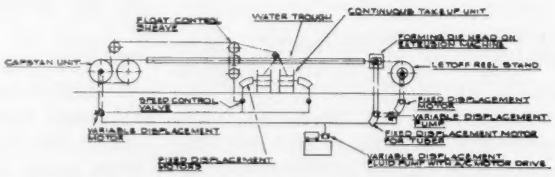


Figure 10.

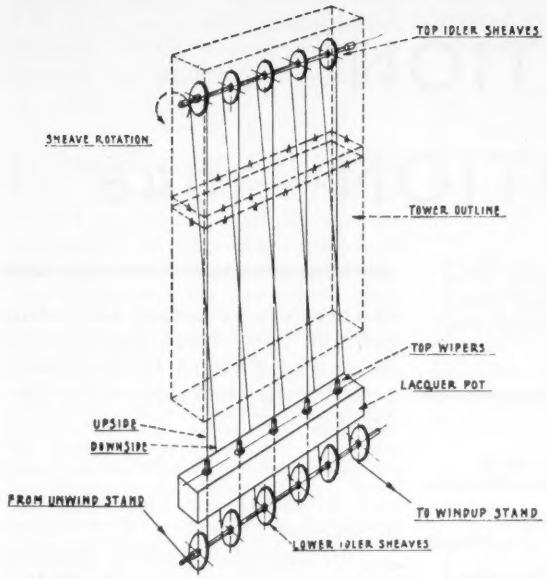


Figure 11.

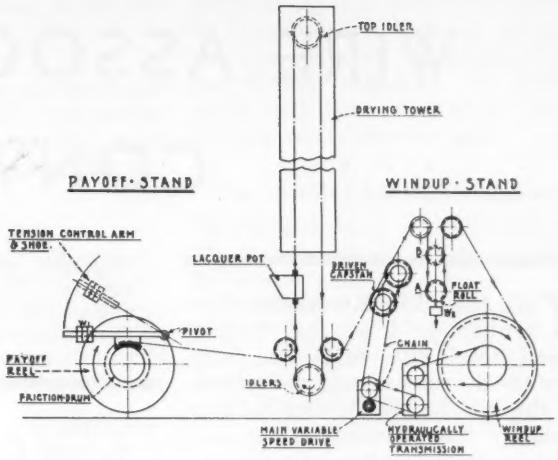


Figure 12.

SUCH a schematic driving arrangement is shown in Figure No. 12. The uncoated wire supply is carried in the letoff reel which is carried in a friction type letoff stand. The strand is then passed under an idler sheave, passes vertically upward and through the coating pot. Immediately thereupon the strand proceeds into the dryer around the upper sheave, vertically downward, around the large bottom sheave, through the second coating pass, etc. This consecutive passage occurs until the required number of dips is complete. The material then leaves the system and passes around a positively driven capstan unit.

★ ★ ★

THE capstan unit propels the wire through the system and performs the same functional operation as the fabric drive rolls. After leaving the capstan unit, the strand passage is through the control and tension loop and thence to the synchronized windup reel.

★ ★ ★

AS WITH any other previously mentioned fabric system, this strand coating system embodies constant material velocity control, constant winding speed and tension control. It is another example of the flexibility that exists in providing continuous material drive.

★ ★ ★

THE drive pictured is a mechanical transmission unit with reel synchronization by hydraulic Servo systems. However, either electronic, variable voltage, or fluid hydraulic would perform with equal ability within the limits of each drive's over-all speed range.

★ ★ ★

TO SHOW how a strand coating system actually appears we refer to Figure No. 13. This photographed equipment depicts the general arrangements of the coating pots, the actual strand position and

(*Please turn to page* 1176)

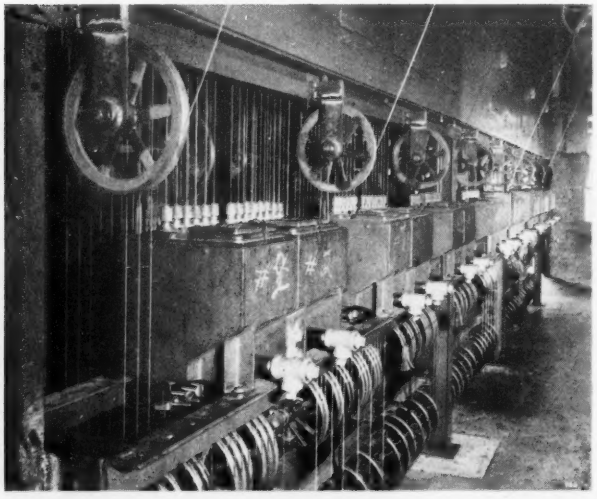


Figure 13.

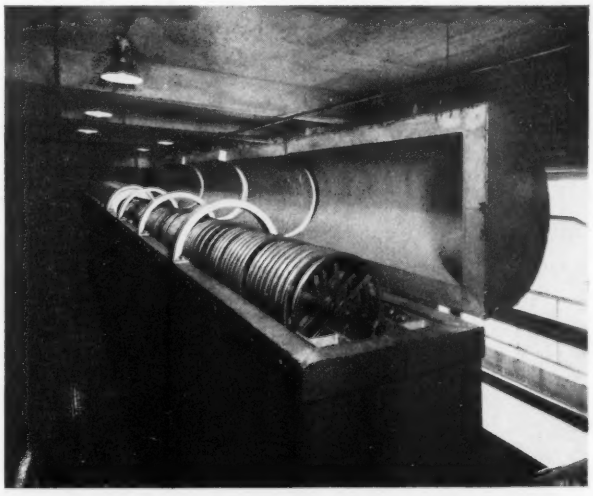


Figure 14.

WIRE ASSOCIATION CONVENTION—1948

Highlights of the Annual Wire Association Convention held at the William Penn Hotel, Pittsburgh, Pa., Oct. 18-22, 1948.

THE 1948 Wire Association Convention held at the William Penn Hotel, Pittsburgh, Pa., October 18-22 inclusive, was undoubtedly the most successful meeting ever held by the Association.

* * *

WITH a registered attendance of 425, the technical sessions were exceptionally well attended, and practically every paper developed most interesting discussions. The opening event—the Annual Directors' Luncheon given to those participating in the program—had an attendance of 45, and at this luncheon the plans for conducting the technical sessions during the week were consummated.

* * *

Directors' Meeting

AT THE semi-annual Directors' Meeting the following matters were discussed:

1. The Secretary and Treasurer's annual report was presented, discussed, and ordered approved.

2. A committee was appointed to select the Mordica Memorial Lecturer for 1949. This committee consisted of

Mr. Ralph K. Clifford, President, Continental Steel Corp., Kokomo, Ind.
Mr. Fred M. Crapo, President, Indiana Steel & Wire Co., Muncie, Ind.
Mr. Ralph B. Roth, Vice-President, Ludlow-Saylor Wire Co., St. Louis, Mo.

3. The President also appointed, as Chairman for the 1949 Convention Program, **Fred M. Crapo,** President of the Indiana Steel & Wire Co., Muncie, Ind.

* * *

THE Directors decided that for 1949 there should be two Vice-Chairmen of the Program Committee — one in charge of the development of papers for the ferrous division, and one in charge for the non-ferrous division; each of these chairmen to be supported by a committee of several members whose duty it would be to secure papers on specified subjects.

* * *

IT WAS decided that an extra effort should be made to develop the non-ferrous section, and to this end the non-ferrous meeting will be pushed forward to Wednesday and Thursday mornings of the Convention week.

* * *

4. Meetings for 1949 were authorized as follows:

The Annual Directors' Meeting, two days, Thursday and Friday, April 14 and 15 at Trenton, N. J.

Worcester Regional Meeting, Friday, April 22.

Canadian Regional Meeting, two days, Thursday and Friday, April 28 and 29, with headquarters at the Mt. Royal Hotel, Montreal, Quebec, Canada.

Pacific Coast Regional Meeting, sometime in June, date to be announced later.

* * *

IN ARRANGING the program for 1949, it was decided to go back to a four-day Convention, as five days seems to be too long. Under this arrangement, the Smoker-Dinner will be held Thursday night to close the Convention.

* * *

Clem McGowan Delivering the Mordica Memorial Lecture * * * *

John Rigby—Presentation of Clock * * * * *

ARRANGEMENTS have been made with the LaSalle Hotel, Chicago, for Convention headquarters for the week starting October 15, 1949.

★ ★ ★

IT WAS the unanimous opinion of the Directors that two things should be done to aid in the development of the Association at this time:

a. To increase the non-ferrous membership and develop more activity in the preparation of papers and attendance at the Convention.

b. To arrange a closer cooperation between the suppliers and the mill men. Since under the Constitution of the Wire Association only active mill men may be directors, the suggestion was made that two representatives of the suppliers be permitted to sit in at the Board Meetings without being directors, participate in the discussions, and endeavor to ascertain the views of the suppliers as a whole, and to increase their cooperation where necessary in the arranging of the Convention Program and the conducting of the Convention.

★ ★ ★

Annual Meeting of the Wire Association

THE Annual Meeting of the Wire Association was held on Wednesday afternoon in the William Penn Hotel, Pittsburgh. The membership was advised of the above actions of the Board of Directors. These were discussed and ordered approved, and the Directors were instructed to proceed with all matters outlined.

★ ★ ★

BY UNANIMOUS vote, the Annual Meeting ratified all actions of the Officers and Directors of the Association for the previous year and ordered the report of the Secretary-Treasurer approved and entered in the Minutes of the Association as read.

★ ★ ★

A VOTE of thanks was extended to the Program Committee and to Messrs. Hussey and Rolle for arranging for the Plant Inspection Trips.

★ ★ ★

THE executive Secretary was ordered to have a set of Resolutions engrossed expressing our appreciation of the action of the British members in presenting the gift of an antique clock to the Association.

★ ★ ★

Annual Wire Association Luncheon

THE Annual Wire Association Luncheon had all seating capacity sold out and a standing audience of from 25 to 30. The program consisted of The Mordica Memorial Lecture entitled "54 Years in the Wire Business," and presented by **Clement L. McGowan,** Superintendent Rod & Wire Mill, Atlantic Steel Corp, Atlanta, Ga.

★ ★ ★

THE Guest Speaker was **Col. Malcolm Hay,** Inf-Res., U. S. A. who spoke on the subject of "The Military Security of the Nation."

★ ★ ★

AT THIS luncheon, **Mr. John Rigby,** Director, John Rigby & Sons, Ltd., Bradford, England, on behalf of the British members of the Wire Association, presented to the Wire Association an early English grandfather clock as a token of appreciation for services rendered by the Wire Association to their members in Great Britain, and as a gesture of friendship from our British members. A photograph and description of the clock are shown on another page.

★ ★ ★

The Mordica Memorial Lecture

THE President of the Association in presenting the Mordica Memorial Lecturer said,

"The Mordica Memorial Lecture was established in 1938 to perpetuate the memory of John Mordica, one of the founders and first president of The Wire Association, who passed away in 1937.

The first lecture was delivered by Dr. S. A. Braley of Pittsburgh Steel Company in 1939.

Successive lectures were delivered by:

B. L. McCarthy, Wickwire Spencer Steel, 1940
K. B. Lewis, 1941
L. H. Winkler, Bethlehem Steel Company, 1942
Flint C. Elder, American Steel & Wire Company, 1943
A. M. Reeder, Jones & Laughlin Steel Company, 1944
J. C. Callaghan, Steel Company of Canada, 1945
Fred M. Crapo, Indiana Steel & Wire Company, 1946
F. Titus Updike, John A. Roebling's Sons Company, 1947

In presenting the Mordica Memorial lecturer to you today, I wish to emphasize that each year in selecting the man to deliver the lecture, it has been the desire of the Board of Directors of the Wire Association to also honor a member who has, during his career in the Wire Industry, contributed either outstanding services or outstanding knowledge to the betterment of the industry.

I think everyone here today knows our lecturer. He was a close personal friend of John Mordica, grew up in the business from its early days, and in his lifetime has probably contributed as much to the development of modern wire drawing practice as any man I know. The Wire Association, in presenting today's lecturer, not only honors the man

John Rigby with Jack Seymour at Clock Presentation

Address by Col. Malcolm Hay, Inf. Res. U.S.A. at Annual Luncheon

for what he has done and what he IS, but honors itself.

I present Clem McGowan, Supt. Wire Mills, Atlantic Steel Company, Atlanta, Georgia, who will deliver the 1948 Mordica Memorial Lecture."

At the conclusion of the lecture, the audience rose, as a token of appreciation for one of the best Mordica Memorial Lectures ever presented.

In presenting the speaker, Col. Malcolm Hay, the President of the Association introduced him as follows:

"The subject of national security is one which must interest every citizen today, in view of the precarious international situation now existing, and the possibility—which we refuse to admit as a probability—that this country may find itself at war in the comparatively near future without any desire on our part to be so involved.

National security effects every citizen of the United States, and includes not only military security but industrial security as well. Industrial Security means industrial preparedness—and that is your business and mine.

In World War I and World War II, this country was protected from invasion by the fact that the war in Europe, in each case, lasted long enough for us to assemble our industrial machinery and to equip and train our military and Naval forces before we were 'in.'

This situation will not exist again. With the development of atomic weapons and of other tools and methods of warfare which are in existence, but of which the public has little knowledge, war now becomes an over-night affair. With this knowledge, members of the Wire Association should cooperate in every way with the industrial preparedness program now being undertaken. Such an operation can be considered not only a patriotic effort, but as being essential for self preservation.

It may be interesting to some of the present members of the Wire Association to know that in 1931, when industrial war planning during peace time was first considered by the Government, Frank W. Bullock, then a First Lieutenant in the Signal Corps of the U. S. Army (now a Colonel retired for physical disability), was Chairman of the War Department Commodity Committee on Wire and Cable, and a member of the Wire Association. In that year, he delivered an address before the Wire Association outlining the vital importance of the wire industry to the war effort and the importance of planning.

In July, 1932, the wire industry preparedness program for national defense was undertaken under a committee consisting of Ralph Clifford (now president of Continental Steel Corp.); L. D. Granger, who was with Wickwire Spencer Steel (now retired); and Richard E. Brown, Executive Secretary of the Wire Association. With the cooperation of the Treasury, War and Navy Departments, a complete estimate of the wartime requirements of the wire and wire products industry was prepared and a survey made of the entire wire industry. This survey resulted in complete data being furnished the War Department as to the productive capacity of the industry, and became the basis of planning for the mobilization of our industry for the war.

Under the auspices of the Wire Association, Louis Johnson, Assistant Secretary of War, presented the industrial mobilization plan as a whole to the Nation in an address at the Wire Association Convention at Detroit.

During the years from 1933 to 1938, the Wire Association also participated in war planning activities such as the substitution of zinc for tin as a coating on fine wires; the development of a trial order system in the industry; assisted in the development of standards and methods of manufacture for bullet core wire, and through the office of its Secretary, who was then a Major in the Signal Corps Reserve, maintained close contact with the war effort through and up to the end of World War II.

We now seem to be facing a somewhat similar situation, although the preparatory method followed differs somewhat from that used in preparing for the second world war. It still behooves us to realize that the preservation of national security is, at the present time, the greatest task facing this nation."

★ ★ ★

"Your guest speaker today, Col. Malcolm Hay, commands an Infantry Reserve Regiment here in Pittsburgh. He was with the Armed Forces, Military Government, and the Government Staff Corps during the war, and received the Legion of Merit for services in France and Germany.

As a member of the National Security Committee, and as Vice-President of the Reserve Officers Association in Pennsylvania, he is in an unusually well-informed position to discuss the subject presented by him today.

It gives me great pleasure to introduce Col. Malcolm Hay, who will speak on the subject of 'The Military Security of the Nation'."

★ ★ ★

IN PRESENTING the antique clock on behalf of the British members, Mr. Rigby expressed the fact that it was in appreciation for the many services rendered to the British members by the Wire Association here, and the hope that during the years the friendship between our British and American membership would continue and develop. As a matter of sentiment, it is hoped that a British member will come over once a year to wind the clock, which only requires winding annually.

★ ★ ★

The Smoker-Dinner

THE Smoker-Dinner had an attendance of 400, which was a capacity house, so far as the William Penn Hotel was concerned, and limited the attendance to that number. Everybody had a good time, but the show could be improved upon.

★ ★ ★

FOR 1949, the President has appointed as Chairman of the Smoker-Dinner **Mr. Eber Hubbard,** of the Hubbard Spool Company, Chicago, Ill. A good show can accordingly be expected.

★ ★ ★

Plant Inspection Trips

ON Tuesday afternoon 220 attended a plant inspection trip at the Wire Mill of Jones & Laughlin Steel Corp., Aliquippa, Pa. Since bus accommodations had been arranged for only 180, and

Sidney Rolle and Ralph Clifford ★ ★ ★

Kenneth Lewis and Wallace Imhoff ★ ★ ★

Ken Davis and Clem McGowan ★ ★ ★

the bus company had no more busses available, a fleet of 22 taxicabs accompanied the 3 busses, so everybody got there safely.

★ ★ ★

AT THE plant a group of guides with arm bands clearly marking them took the visitors around in small groups, explained every operation carefully, answered all questions, and expedited the inspection trip through the plant.

★ ★ ★

IT WAS without doubt the most successful plant inspection trip the Association has had, and great credit should be given to **Mr. Hussey** for his arrangement and conducting of the event. Incidentally, he should take a bow because of the many comments heard about the cleanliness and orderliness of the plant.

★ ★ ★

THE Westinghouse Electric Corp. plant inspection took place on Thursday afternoon with an attendance of 86. While the visit was interesting, it was somewhat of a disappointment, as the wire mill operations at East Pittsburgh had been discontinued and moved to Buffalo, N. Y. some time ago. However, many interesting ways of using wire in various kinds of electrical equipment were shown, and the plant visit was voted a success by those who attended.

★ ★ ★

The Technical Papers

EVALUATION of the technical papers presented at the annual meeting of the Wire Association held at the William Penn Hotel, Pittsburgh, Pa., Oct. 18-22, shows that the younger members are being given the opportunity of expressing themselves and because of the move in this direction the association is being strongly undergirded.

★ ★ ★

A RESUMÉ of the technical papers and their discussion, which were presented at the recent Pittsburgh convention follows:

★ ★ ★

MONDAY PAPERS

Practical Development of Modern Wire Drawing Compounds, by E. L. H. Bastian, Staff Engr., Shell Oil Co., New York, N. Y.

A DRAWING compound must be suitable for reducing wire at the highest possible drawing feed without interruption, must afford reasonable die life in relation to the wire production obtained, and assure the right finish on the drawn wire. A lubricant designed for maximum friction reduction is the best in rod breakdown operation or in drawing wire not requiring a high finish, such as welding rod. New types of continuous high-speed machines for heavier rod and wire are coming into wider use particularly in the nonferrous drawing field.

★ ★ ★

ESSENTIALLY three classes of lubricant are used in the drawing of both ferrous and nonferrous wire. These include dry soap compounds which usually are employed in single hole or two and three draft machines on ferrous wire of heavy gage. In high-speed wire drawing, wet-wire methods are used, since dry soap in high die temperatures would char and be useless. Another type of lubricant is the wet wire solution or emulsions made by mixing compounds, usually paste, with water in various concentrations. And then there are drawing oils, representing various types of compounded mineral oils and other fluids, which are being increasingly used for drawing such metals as stainless steel and aluminum. This is a relatively new field but growing rapidly based on industry demand for stainless steel and aluminum wire. For drawing these metals the most promising results at the moment are obtained with oil type fluids.

★ ★ ★

SOME types of active cutting oils, containing fats or fatty acids have been used satisfactorily for drawing heavy stainless wire at low speeds. Recently the replacement of a water emulsion with drawing oil in a machine using diamond dies resulted in a 20 per cent better surface finish and much improved die life.

★ ★ ★

ALUMINUM wire drawing is coming into increased prominence in many mills. The drawing operation is performed on the same equipment as used for copper and brass wire and in many cases at comparable speeds for given wire size.

★ ★ ★

IN the discussion, which followed the presentation of this paper, **Mr. Bastian** pointed out that the best compound used for drawing copper wire, generally speaking, is one containing from 0.5 to 0.7 free fatty acid to minimize the soap.

Allan Dove and J. L. Whitten * * *

"Red" Crewe and W. E. Fischer-Sulzer * * *

Pete Beaman and Roger Scott * * *

He cautioned that in drawing fine wire, it is best to use high soapy concentration to the point of foaming. He made it plain that excessive fats give sticky wire on roughing. The speaker further explained that in drawing intermediate sizes of wire, both soaps and fats are employed in the form of an emulsion. He suggested that a concentration of 4 to 5 per cent be employed on the rod breakdown and from 2 to 3 per cent concentration on the intermediate pass. In explaining how a compound is prepared, the speaker mentioned that the material in paste form is mixed with water at a temperature of 160° F; the solution then is agitated to obtain a homogeneous emulsion.

* * *

IN reply to the question, "What method is being used, if any, for dry and wet drawing of large size wire that has been nickel plated?" submitted by **A. M. Reeder**, Metallurgical Engineer, Jones & Laughlin Steel Corp., Pittsburgh, the author stated that "we have had some experience with emulsions and they seem to be highly satisfactory, and," he added, "we have encountered similar experience in the drawing of light wire."

* * *

Fumes and Ventilation in the Wire Mill, by Wallace G. Imhoff, President, The Wallace G. Imhoff Co., Los Angeles, Calif.

IN successfully handling material in a wire mill and to secure proper ventilation, the speaker offered two suggestions; a unit closed system for each piece of equipment sending off heat, acid fumes, or gases; and a building properly engineered for the elimination of fumes.

* * *

THE speaker drew attention to one company which greatly reduced accidents by instituting a short rest period during which milk was supplied to the workmen. He pointed out that wood still is an ideal material for use in the pickling room as a means for exhausting the fumes.

* * *

HOODS built of this material and brought down low over the furnaces and pots form practically an effective closed system. In reply to a question submitted by **William Meredeth**, Colorado Fuel & Iron Co., Pueblo, Colo., concerning the removal of gasoline fumes from the handling trucks operated in the warehouse, the author explained that as far as he knew nothing ever had been done along this line.

* * *

WM. PARKIN, President, William Parkin Co., Pittsburgh announced that a new machine for the production of ozone and which sells for approximately $500 per machine has been developed and will eliminate the use of inhibitors.

* * *

Practical Application and Mill Practice with Carbide Dies, by E. T. Miller, Die Service Engr., Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.

SINCE 1932 carbide dies have replaced steel and cast-iron die plates almost completely. Their use, he explained, has resulted in almost a three-fold increase in drawing speeds up to more than 1500 feet per minute on ferrous metals and considerably higher on some ferrous metals, additional advantages being greater accuracy, longer life, improved finish on the product and more economical use, because carbide dies are much easier to recut and maintain.

* * *

PRESENT wire drawing practice involves up to 38 per cent reduction on low carbon and from 25 to 30 per cent for high carbon or spring wire. Drawing or reduction angle ranges from 14 to 18° for low-carbon wire and is reduced to about 12° for high-carbon or rope wire.

* * *

MR. MILLER warned that recutting beyond the maximum recommended hole size in an endeavor to utilize the carbide wall thickness which must be otherwise scrapped, is impractical. With a short nib, he stated, the entrance and reduction angles become too wide in trying to make room for a larger entering size, and the draw pull and back pressure become too great. Excessive power consumption may result, he stated, as well as the possibility of impairing the finish of the drawn product, due to the formation of slivers from overcrowding in the reduction zone, resulting in nib or wire breakage. He drew attention to the fact that too short a nib causes the bell to become two shallow for the proper lubrication and guiding of the wire into the die.

* * *

A. F. Beighley and A. Lauder * * *

E. J. McIlvried, D. C. McDonald and John Rigby * * * * *

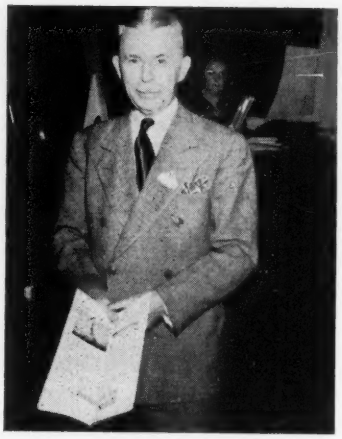
G. L. May and Curtis Voightlander * * *

NEW high nibs afford room for the most efficient drawing angle in the reduction zone, the speaker pointed out, and its height permits a cored back-relief based on the maximum recommended hole size. For this reason, he explained, there is no need to touch the relief as the die is recut successively to the maximum hole size. This feature by itself saves many hours in the user's die room. In recutting a die to a larger size, the speaker recommended that the reduction angle first be recut to accommodate the next larger wire size to be drawn. The bearing then can be enlarged from the back of the die to the corresponding size of the drawn wire.

★ ★ ★

PROLONGED discussion followed the presentation of this interesting paper. **H. B. Clark,** Vascoloy Ramet Corp., Waukegan, Ill., mentioned that in 1932 there was confusion in the wire and die industries because of the lack of nib standardization, and as a result some 157 styles of nibs then were in use. An effort was made, the speaker stated, to maintain a 5:8 ratio of nib to height. But, **Mr. Clark** went on to say, as the height of the nibs increased the die breakage also increased, and so it was felt that somewhere along the line there must be a compromise between the die height and in utility. Inasmuch as the introduction of the deep backing die decreased the die cutting costs 20 per cent, it would appear that there is some justification for the 5:8 ratio, as mentioned by **Mr. Miller.**

★ ★ ★



Richard Neuhaus * * * * * *

MR. CLARK cautioned diemakers not to go hog wild on the length of dies or they would be faced with die breakage.

★ ★ ★

C. VOIGTLANDER, superintendent Wire Mills, Union Wire Rope Corp., Kansas City, Mo., drew attention to the fact that hardness is an important property of the die whether it contains 6 per cent cobalt or higher as a binder.

★ ★ ★

MR. MILLER, in conclusion, said that in his experience the die does not break up in the bell, but in the reduction angle, and he emphasized that his company has increased the nib cautiously without removing the reduction bearing up into the die.

★ ★ ★

TUESDAY PAPERS

Control and Production of High-Carbon Wire by J. G. Weiss, Supt., Patent and High Carbon Wire Dept., Keystone Steel & Wire Co., Peoria, Illinois.

IN the author's experience drawing of green or unpatented rods often causes trouble in subsequent processing, due to frequent rupture of either the surface or internal structures. He declared that patenting makes the structure uniform, ductile, and highly plastic so that it lends itself well to cold work for drawing operations.

★ ★ ★

THE speaker preferred natural gas as fuel inasmuch as it produces a more uniform temperature throughout the furnace. In the author's opinion, it is cleaner, operates with much less maintenance and is much more economical. A highly oxidizing atmosphere is maintained in the larger furnaces to purposely produce a heavy scale which is then cracked off by mechanical bending. After the rod or wire passes over the scale breakers, the surface is comparatively clean and free of scale. The normal steel loss caused by this heavy scaling is about 1½ per cent, **Mr. Weiss** stated. This loss, however, is offset by lower cleaning costs since this material can be cleaned quickly and much more economically than if it had a thin or adherent surface scale which is impervious to the action of cleaning acids.

★ ★ ★

IN drawing attention to the more recently developed methods of processing, particularly the electrical resistance patenting machine, the speaker mentioned that

Bucky Buchanan, Cy Hannon—with Ralph Roth in Foreground * * * * *

R. L. Hamaker and Fred L. Schraub * * *

Rowland M. Hussey * * * * *

the wire is quickly heated by an electrical charge and quenched in lead, at any desired temperature.

★ ★ ★

WITH this type of patenting, **Mr. Weiss** asserted, a highly ductile and refined structure is produced and because there is practically no scale on the surface, the material is cleaned easily. For this reason, he explained, the wire may be galvanized without any intermittent cleaning other than the usual muriatic acid bath used in galvanizing operations.

★ ★ ★

ATTENTION was drawn to a serious error frequently committed in the patenting process, namely, permitting rods to be stopped in the furnace for more than a few seconds. If such stoppage occurs, the speaker declared, the section affected will be that short length just at the exit end of the furnace which has cooled too slowly. Variations in the structure of the wire at this point are clearly shown by photomicrographs.

★ ★ ★

THE speaker advocated the use of water-cooled dies and blocks in order to dissipate the heat generated during the drawing operation. This cooling, he explained, is absolutely essential if the highest quality wire is to be finished at the indicated speeds, and especially is this true where uniformity and close tolerances are required.

★ ★ ★

R. V. Olsen and James Day * * *

A PROGRESSIVE buildup of heat within the coil that seriously affects physical properties occurs when drawing wire 0.120 and larger on large single blocks even though they are water cooled, according to Mr. Weiss. He drew attention to the fact that this nonuniform condition within the coil can be overcome by blowing a blast of air on the wire during the drawing operation, or by passing the wire through cold running water immediately after it emerges from the die. In his opinion, the latter process is the most effective for rapid dispersion of the heat.

★ ★ ★

IN the discussion of this paper **H. G. Verner,** R. H. Miller Co., Homer, N. Y., inquired if any good was obtained by drawing back the unheated section of the wire when the patenting furnace is started up. **Mr. Weiss** explained that pulling the wire back into the furnace for about 6 inches did remedy the condition.

★ ★ ★

H. **M. JENION,** Pittsburgh Steel Co., Monessen, Pa., asked what method the author employed, if any, for forced cooling of rods during production. Mr. Weiss pointed out that on 0.343 rods and larger that forced air was employed for this purpose. The author also explained that while he did not obtain 100 per cent uniform cooling yet to all practical purposes the cooling was satisfactory.

★ ★ ★

MR. **WEISS,** in amplifying the data presented in his paper, mentioned that because fine wire coming from the electric patenting furnace was practically free of scale, it was passed to the galvanizing pots without further treatment. He made it plain that the the electric patenting furnace costs more to operate. Over an average of two years, the cost of electric patenting was twice as much as with gas-fired furnaces. Oil-fired patenting costs 5½ times as much as electric patenting.

★ ★ ★

THE author also drew attention to some of the disadvantages of the electric patenting furnace. He made it plain that the cost of operation is higher because of power costs and that because of the necessity of having to run only wires of the same size at any one time there was a considerable loss in production and an increase in scrap

"Ernie" Clark * * * *

J. L. Schueler * * * * *

"Rod" Tatnall * * * * * *

which arose from changing from one size to another.

★ ★ ★

IN conclusion, **Mr. Weiss** directed attention to pickling room practice as followed at his plant. His procedure is to pickle wire in a fresh tank of acid and later swing onto rods. Once a day the vat of spent acid is dumped especially when its strength gets down to around 2 per cent. The author also brought out that residual alloys affect the physical values of wire. For instance, he stated, tensile strength increases fast, particularly when the hardening elements of nickel, chromium and tin are present.

★ ★ ★

Evaluation of Pickling Inhibitors from the Standpoint of Hydrogen Embrittlement by C. A. Zapffe, Cons. Met., and M. E. Haslem, Research Chemist, Baltimore, Md.

DR. ZAPFFE in presenting this paper disclosed that the presence of commercial pickling inhibitors in the pickling solution did not reduce embrittlement of steel wire of the type 440-C. Instead, he stated, these reagents often made the embrittlement much worse than that resulting from pickling in raw acid. While the behavior of these several reagents differed, not one of the half dozen tested improved pickling brittleness, he declared.

★ ★ ★

AS a further check on disclosures, the authors employed two additional grades of stainless steel, namely type 410 and 431, in their research. Pickling these grades in raw acid caused no measurable embrittlement, yet they found that the addition of an inhibitor initiates measurable embrittlement.

★ ★ ★

OF more than a dozen inhibitors employed in the investigation, eleven caused greater embrittlement by their presence in the acid than that caused by pickling in the raw acid itself. It was also found that two of the inhibitors neither increased nor decreased the degree of embrittlement caused by the pickling of uninhibited acid. **Dr. Zapffe** was of the opinion that since these results are accompanied by a customary great decrease in metal attack, and therefore in total hydrogen produced, they must be based upon a great increase in the proportionality factor for hydrogen dissolving in the metal versus total hydrogen produced. This he explained is a matter of subtle surface chemistry and is not yet understood.

★ ★ ★

IN his concluding remarks, **Dr. Zapffe** announced that two preliminary compositions for special inhibitors had been derived which point the way to correcting the problem of pickling brittleness with susceptible stainless steels. The speaker also was of the opinion that hydrogen free steel may eliminate many breakage problems in the wire industry, although he stated that it will be a problem to obtain this class of steel because of the hydrogen pickup from the mold wash and furnace atmospheres. He was also of the opinion that some inhibitors in acid causes the angle of bend to increase and then decrease so that there is no difference between the pickling in raw acid and inhibited acid. He amplified this statement by saying that after pickling, the steel becomes more embrittle and then ages back again. The angle of bend, he explained, goes down and then recovers. He declared that sulphur is an extremely active promoting agent. The speaker concluded that the presence of hydrogen at the time of solidification has a marked effect on the steel for a long time to come.

★ ★ ★

WEDNESDAY PAPERS

Wire Drawing Research in the British Iron and Steel Research Association by W. C. Hessenberg, British Iron & Steel Research Association, London, England.

IN the absence of the author this paper was presented by **G. K. Rylands,** Rylands Brothers Ltd., England. The author dwelt at some length on the process of back pull for reactive wire drawing. He said the most important thing about the use of this particular method of drawing is the fact that the load of the die is reduced. Some of the advantages which were cited were that the process reduces the die load as well as the frictional drawing forces, a small power saving is effected, die life is prolonged, and there is less heating of the wire. **Mr. Rylands** raised the question as to whether any of these advantages is large enough to be of commercial significance.

★ ★ ★

IN discussing this paper, **T. B. Somerville,** Marshall Richards Machine Co., England pointed out that with the recently developed reactive wire drawing machine certain materials can be drawn at double the speed without interfering with the quality of the product.

★ ★ ★

Wear Resistance of Wire for Wire Ropes by R. S. Brown, Chf. Met., Rylands Bros., Ltd., Warrington, England.

THIS paper also was presented by **G. K. Rylands** in the absence of the author. One of the matters of importance brought out by this paper was that when high-carbon steel is raised to a temperature above the transformation point and then rapidly quenched, martensite is formed as a brittle, hard, constituent. The author mentioned that for many years several haulage rope failures have been attributed to the formation of a substantial film of martensite on the worn flat surfaces of the outer wires. He went on to explain that because of the extreme brittleness of this film it is impossible for the wire to be bent without the surface fracturing.

★ ★ ★

HE was of the opinion that the resistance to plastic flow is directly related to the tensile strength of the wire. He concluded that the plastic wear in wire ropes is bound to consist of the production of a severely cold worked film which may be exceedingly brittle, depending upon the nature of the wire manufacturing process. He expressed the opinion that this surface layer is continu-

(*Please turn to page* 1153)

Description of Antique Clock Presented by British Members

THE massive mahogany case standing about eight feet high was made about the year 1770. The brickwork ornamentation of the plinth and clusters of fluted columns to the head are noteworthy features, the latter being quite unusual. The Corinthian capitals and other metal ornamentation is picked out with gold. As the dial door is not constructed for frequent opening, it seems very probable that this case was originally made for a 3 month or long period clock. To open this door the two pegs at each side are withdrawn and the door frame lifted down. There are no hinges. Although about 178 years old, the case is in very good condition and has been carefully restored and processed against woodworm.

★ ★

THE movement and dial have been newly constructed by the writer in keeping with the requirements of the case. The movement is designed to go for 400 days without rewinding. A small number of these year duration clocks were made in London in the early eighteenth century by the celebrated makers Thomas Tompion and Daniel Quare and there are also a few examples of provincial make and later date. The year long case clock was a luxury demanding too much skill in construction ever to come into general use although the aesthetic and practical value of an "anniversary clock" as they could appropriately be called are worthy of consideration. The older examples frequently required an 80 lb. weight to drive them. The maker of the present clock employed the general principles of the old craftsman while introducing some of the facilities of later days such as Geo. Grahams dead beat escapement and Skefko ball bearings on the heavily loaded barrel arbor. Using, as it does, a 40 lb. weight, the efficiency of this clock becomes about 13 times that of a common eight day long case clock. The falling of the weight about one eight thousandth part of an inch keeps the clock going one minute during which time the pendulum travels about 135 inches. Pinions of 12 leaves are used throughout the train and the total gearing ratio is 34,560 to 1. Shutter maintaining power is fitted which keeps the clock going while being wound and prevents the key being inserted until the maintaining power has been put into operation. Double clickwork is fitted to the barrel for safety in winding. The pendulum is an "Invar" rod with lenticular bob provided with graduated rating nut for coarse adjustment, and a small shelf for small weights, for fine adjustment without stopping the pendulum. A degree scale is provided, the escaping arc being 1 deg. each side of zero and the swing arc about 1 deg. 30 min. The delicacy of a clock of this kind is shown by the fact that the hour hand as well as the minute and seconds has to be balanced. Guides are fitted to the case to prevent the flat weight from twisting.

THE lacquered brass and silvered dial is hand engraved and bears around the arch an ancient sundial motto reminding us that Time can neither be kept nor destroyed. "Tenere non potes nec perdere." In the arch is a rotating sphere moon showing the phasing of the moon around which a hand points out the age of this luminary. The hour and minutes are indicated on the usual 12 hour circle, the seconds being given on a sunk seconds dial, below the centre of the dial. The matted dial centre is relieved by a segment of a circle on which are pointed out the number of days which have elapsed since the clock was wound. The hand pierced hands are of blued steel, and the corner pieces are spandrells of brass, pierced in scroll work pattern, and finished to give a damaskeened effect.

John Rigby
Director of
John Rigby &
Sons, Ltd.
Manchester,
England
Who Made the
Presentation
of the Clock
at the
Wire Association
Convention
Pittsburgh, Pa.
October 20, 1948

LABOR RELATIONS

By John B. Stone
Washington, D. C.

The twentieth in a series of articles on the subject, with particular reference to problems of the wire and wire products industry. The author is a noted authority on the subject.

OBSERVERS here are convinced that the tremendous political upset which swept President Truman into office with a Democratic House and Senate will have definite labor-relations repercussions which will be felt at the plant management level before the year 1949 is very old.

* * *

IT is generally conceded that the Taft-Hartley Labor Relations law will be repealed outright or at least softened up to the point where it will be more like the old Wagner Act than the present statute.

* * *

THIS, of course, means that managers and labor directors of Wire and Wire Products plants will have to rearrange their thinking on relations with union employees.

* * *

THE sharp teeth of the Taft-Hartley act had just begun working to their fullest when the political upset came. A general pattern on many major issues was being developed. Now that pattern doubtless will change form before it even is hardened into general practice.

* * *

THERE is ample evidence in the capital indicating that organized labor will exert more influence on the Truman administration than ever before. Senator Howard McGrath, chairman of the Democratic National Committee in his first victory statement gave much credit for the upset to labor.

* * *

A TABULATION on a national basis shows that 51 of the 54 members of the House of Representatives who were defeated had voted for the Taft-Hartley law. Six Republican Senators who had voted for the law were defeated.

(*Please turn to page* 1170)

INFORMATION OF THE FIRST CANADIAN REGIONAL CONVENTION

Definite plans have been made for Canadian Regional Wire Association Convention in the Spring of 1949.

Location — Montreal, Que., Canada

Convention center and registration—Mount Royal Hotel, Montreal

Date of Convention —
THURSDAY, APRIL 28th and FRIDAY, APRIL 29th.

Program of Convention to consist of:—

(a) Two plant visits to Ferrous and Non-Ferrous Wire Mills in Montreal area.
(b) Convention dinner.
(c) Technical papers of interest to Ferrous and Non-Ferrous wire drawing men.

Further detail information will be available for future issues of
WIRE AND WIRE PRODUCTS

GOVERNMENT WIRE PRODUCTION INFORMATION

X-Ray Measurement of Strain in Metal

IT IS possible, by means of X-ray diffraction, to measure the interatomic spacing of crystals. Because a crystal deforms under the influence of an applied stress, with a resultant change in the interatomic spacing, X-ray diffraction can be utilized to determine the magnitude of strain in the crystal. Such a method of measuring strain offers many advantages, but several unresolved difficulties have limited its application, though the technique has been under study for the past twenty-five years. Comprehensive investigations by the Metallurgy Division of the National Bureau of Standards in the field of X-ray strain measurements have been directed toward improving the sensitivity and precision of this method of determining strain in metals.[1] The Bureau's special interest lies in the possible importance of the method in detecting fatigue damage in metals before an actual fracture occurs.

* * *

DEFORMATION of metals can be of two kinds, elastic and plastic. Elastic deformation is the result of a change in interatomic spacing, while in plastic deformation slipping of the atomic planes takes place without change in the dimensions of the crystal lattice. Because of this difference, the strain measured by X-ray diffraction is limited to the elastic portion and is not affected by elastic deformation. For some purposes this is a major advantage as compared to those methods which measure only the total strain. Other advantages are: (1) The length over which the strain is measured can be made very small; (2) the strain can be determined without the necessity of a measurement on the unstrained metal; (3) the strain is measured in a very thin surface layer. These advantages make the method particularly suited for applications such as the determination of internal stresses in metals.

* * *

AS opposed to the advantages of the X-ray method of measuring strain, there are several disadvantages, the most serious of which is the lack of sensitivity. The determination of strain involves measuring the change of diameter of the diffraction ring from the specimen. In the case of metals this ring is inherently quite diffuse, due to imperfections in the metal crystal. With annealed metals the width of the ring is about the same magnitude as the maximum diameter change expected from elastic strain. For cold-worked metals the ring becomes much more diffuse and it is diffi-

TRADE MARK REG. U. S. PAT. OFF. MICRO-WELD MICROMETER PRECISION

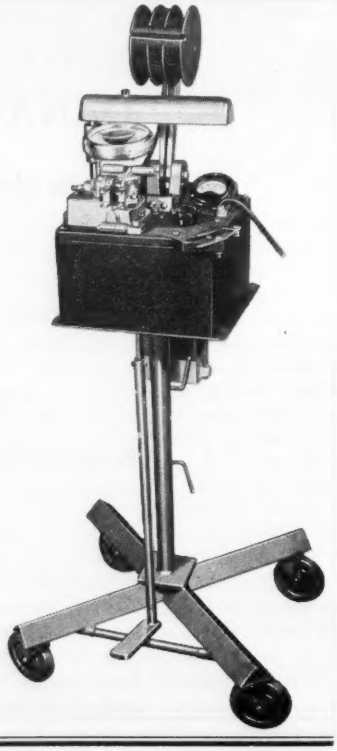
MODEL M-T MICRO-WELD BUTT WELDER

This welder was designed and developed expressly for welding all types of fine wire: Aluminum, Copper, Brass, Bronze, Steel and Steel Alloys, ranging in size from .005" to .020" diameter.

Unit design of frame, transformer and power sub-assemblies permit other range of sizes to suit requirements.

Equipped with a temperature indicating annealing and tempering device, voltage regulator and meter to compensate for voltage fluctuation, wire cutters, extra large 5" diameter magnifying glass, fluorescent light and extension cord. Welder can be supplied for bench mounting, or mounted on 4-wheel truck.

The adaptability of this unit for welding all types of wire, either ferrous or non-ferrous, in sizes from .005" to .020" diameter, make it ideal for the fine wire manufacturer.



MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE CHICAGO 6, ILL.

Telephone: State 2-7468

cult to detect any change due to elastic strain.

★ ★ ★

ALTHOUGH improved X-ray strain measurements have resulted from the Bureau investigation, the work was initiated primarily to apply the X-ray stress measurement technique to detection of fatigue damage in metals. Fatigue is the term used to denote the progressive fracture of metals under the action of fluctuating stress. The magnitude of the fluctuating stress which will eventually cause failure is much smaller than that required to fracture the metal under static conditions, and as a result fatigue is a primary cause of failure in machine elements. The course of a fatigue fracture can be divided into two stages: First, the metal undergoes some sort of deterioration or damage which finally results in the formation of a very small crack; and second, the crack grows until the member is weakened to such an extent that it fractures suddenly. At the present time no reliable method is known for the evaluation of the damage which takes place during the first stage except through a fatigue test. It would be extremely valuable if some means were available for measuring this damage by nondestructive means.

★ ★ ★

IN 1941, Glocker, in Germany, reported the results of X-ray stress measurements made on fatigue specimens, by means of which he claimed to be able to detect fatigue damage. The method involved the measurement of surface stress in the specimen under static load after various amounts of fatigue stressing. He found that after the specimen had been damaged by fatigue stressing, the stress in the extreme surface layers was not as large as it would be if the material were homogenous. Because of the apparent significance of these results, it seemed desirable at the Bureau to pursue further this line of investigation.

★ ★ ★

IT WAS immediately evident that the primary requirement was to

made with
KEYSTONE WIRE

When you insist on the best in materials and workmanship, you'll make a hit with customers every time. Take the wire that holds the bristles so securely on NACO Brushes, for example.

Keystone BRUSH WIRE is specified by the manufacturer because its attractive silver-brite galvanized finish does not chip or peel when tightly twisted. Also, this quality wire has the proper ductility for accurate forming.

Yes, it's this critical choice of materials . . . plus expert craftsmanship that assures the National Brush Company of an established place in their market.

The Keystone organization takes pride in the fact that Keystone Wire is a recognized factor in the sound construction of NACO Brushes.

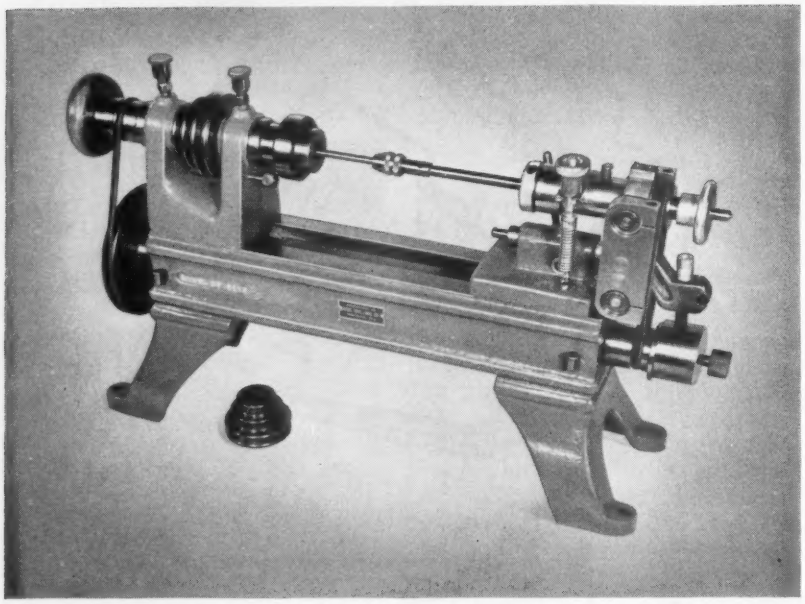
**The National Brush Company*
Aurora, Illinois

KEYSTONE
MUSIC SPRING WIRE
KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

SPECIAL ANALYSIS WIRE
for all industrial purposes

KEYSTONE STEEL & WIRE CO., Peoria 7, Ill.

HERE IT IS



THE NEW 1949
ROOS Semi-Automatic
POLISHER
model "OT"
For finishing and polishing Tungsten Carbide Dies.

It's the fastest, most efficient and "easiest to handle" polisher we've made.

- Has the new Pressure feed adjustor.
- New Style improved Belt.
- Kwick opening PIN HOLDER.
- Plunger type action.
- Standard Ball Bearing equipped.

and

For old style Roos Polishers—this new oscillating tailstock can be readily attached.

WRITE OR WIRE FOR PRICES TODAY.

ROOS
TOOL & MANUFACTURING CO.
NEWARK 4, N. J.
Factory & Shipping point—Montclair (Newark Suburb)

Also Distributed by

Carboloy Company, Detroit, Mich. Branches in all principal cities
Canadian G. E. Co., Toronto, Canada
International General Electric Co., Schenectady, N. Y.
Vascoloy Ramet Co., Chicago, Illinois

obtain better precision of stress determination than is possible with the methods commonly used. In the method devised by the National Bureau of Standards the film is placed at right angles to the incident X-ray beam so that it intersects a diffracted beam at an angle that depends on the spacing of the reflecting planes according to the Bragg equation,

$$n\lambda = 2d \sin\theta.$$

In this equation **n** is the order of the reflection, λ is the wavelength of the X-rays, **d** is the interplanar spacing, and θ the diffraction angle. When **d** is changed by the application of stress to the specimen, the strain in the direction of the normal to the reflecting planes is measured by the change in θ. As X-rays can be diffracted in any direction making an angle of $180°-2\theta$ with the incident beam, the diffracted beam forms a cone which intersects the film in a circle. The diffraction angle is computed from the specimen-to-film distance and the radius of the diffraction ring. It is usual practice to measure the radius at one or two points with a vernier scale.

* * *

THE primary factor that limits the precision of the X-ray measurement of stress is the diffuseness of the diffraction ring, which makes it impossible to obtain exact values for the ring radius. As there did not appear to be any experimental method which would significantly improve the accuracy of a single measurement, it was decided to increase the precision of the stress determination by making a number of measurements of ring radius. For each stress condition, therefore, two diffraction patterns were taken at different angles of incidence, and twelve measurements of ring radius (at 30° intervals around the ring) were made on each pattern using a recording microphotometer.

* * *

BECAUSE the diffraction ring of a stressed specimen is not exactly circular, special methods of handling the data were developed to give a single value representa-

(*Please turn to page* 1166)

Outstanding Personalities of the Wire Industry

Plume & Atwood Mfg. Co. Appoints Jas. F. Curtis

JAMES F. Curtis has been appointed plant manager of the brass mill at Thomaston, Conn., for **The Plume & Atwood Mfg. Co.**, Waterbury, Conn. Mr. Curtis has formerly been associated with Revere Copper & Brass, Inc.

* * *

Blanchard to Ross Engr. Corp.

C. E. (Charlie) **Blanchard** has been added to the staff of the Boston Office of the **J. O. Ross Engineering Corporation** and will continue in the work in which he was engaged for the past twenty years with B. F. Sturtevant Company, later a Division of Westinghouse. This work includes design and sales of Special Drying Equipment. Mr. Blanchard has designed and installed many modernized systems in the Rubber and Textile industries and is also an expert in special handling conveyorized installations.

C. E. Blanchard, Ross Eng'g Corp., Boston, Mass.

* * *

HIS "Know How" will be added to that of the already large staff of Ross Engineers.

* * *

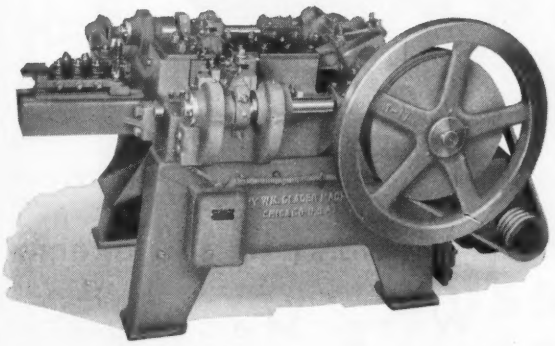
Alden G. Roach Named President Of Columbia Steel Co.

BENJAMIN F. Fairless, president, United States Steel Corp., announced that effective November 15th, **Alden G. Roach,** president of Consolidated Western Steel Corp., succeeds J. Lester Perry as president of **Columbia Steel Co.,** the steel-producing subsidiary of U. S. Steel Corp. on the Pacific coast.

* * *

MR. PERRY, formerly president of Carnegie-Illinois Steel Corp., was called back from retirement on May 1, 1947, to assume presidency

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS
210 No. Racine Ave.
Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

of Columbia following the sudden death of its president, William A. Ross. After November 15, 1948, Mr. Perry remains with U. S. Steel serving in an advisory capacity.

* * *

FOR the last eight years, Mr. Roach has been president of Consolidated Steel Corporation, which recently became a subsidiary of U. S. Steel under the new name of **Consolidated Western Steel Corporation.** Mr. Roach will continue as president of Consolidated Western Steel.

* * *

THE principal office of Columbia Steel Company is at the Russ Building in San Francisco. The headquarters of Consolidated Western Steel Corporation will continue to be at Los Angeles.

* * *

Kaiser Co. Inc. Appointments

MARK T. Anthony has been appointed assistant to the vice-president and general manager of **Kaiser Co., Inc.,** Iron & Steel Div., Oakland, Calif. Mr. Anthony has been in the cost and commercial planning division of the company for the past three years. **Earl S. Reynolds** has been appointed director of public relations in Southern California for the company. Mr. Reynolds has been in public relations work for many years and has held various positions with the Kaiser interests, the last of which was manager of Fleet Sales in Southern California for the Kaiser-Frazer Corp. His new headquarters are at Fontana, Calif.

* * *

Joseph E. Williams Heads Rod and Wire Works of Youngstown Sheet & Tube Company.

JOSEPH Emrys Williams, formerly of Sterling, Ill., has been appointed superintendent of **The Youngstown Sheet & Tube Company's** Rod and Wire Works at Struthers, Ohio, succeeding J. H. Shilling who retired recently.

MR. Williams, a native of South Wales, began working at the age of 17 as a laboratory assistant for Blaenavon Steel, Iron & Company, in South Wales and soon advanced to an open hearth helper.

* * *

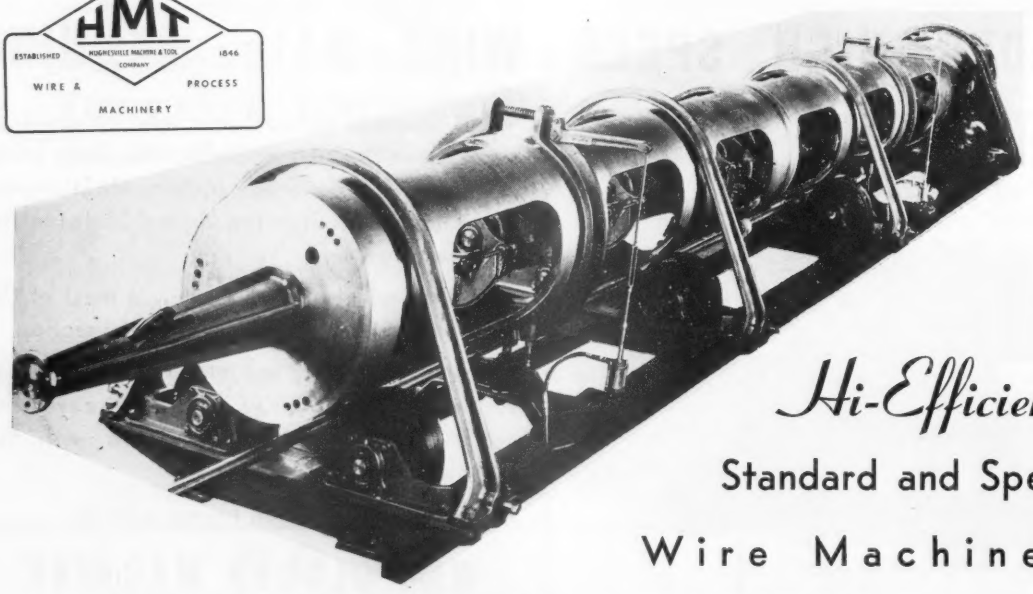
SHORTLY after he came to this country, Mr. Williams joined American Steel & Wire in Cleveland. He later became superintendent of the wire mill for Northwestern Steel Wire at Sterling, Ill., then plant superintendent for Reynolds Metals Company, at Louisville, Ky.

* * *

Portsmouth Steel Corporation Appoints J. F. Timmerman, District Sales Manager at Detroit, Michigan

THE **Portsmouth Steel Corporation** announces the appointment of **J. F. Timmerman** as District Sales Manager, with offices in the Penobscot Building, Detroit, Michigan.

* * *



Hi-Efficiency

Standard and Special

Wire Machinery

HUGHESVILLE MACHINE & TOOL COMPANY

HUGHESVILLE MACHINE & TOOL CO.
54 ACADEMY STREET
HUGHESVILLE, PA.
'Phone: 129-A

THOMAS S. HUGHES
35 ADMIRAL ROAD
TORONTO 5, ONTARIO, CAN.
'Phone: Randolph 6041

MR. TIMMERMAN has been with Portsmouth Steel since January, 1948, following his two years with the Navy and nine years with Keystone Steel & Wire Company of Peoria, Ill. Our best wishes for success to Mr. Timmerman.

* * *

J. S. Thomas To Direct Armco Steel Purchasing

W. W. SEBALD, president of • **Armco Steel Corporation** has announced that **Joe S. Thomas** had been appointed Director of Purchases, and **Charles Beck,** Manager of Raw Materials Supply. Mr. Thomas fills the vacancy caused by the death of Newman Ebersole who passed away in September.

* * *

HE joined the Armco organization in 1927, directly after graduation from Cornell University where he received a degree in Mechanical Engineering.

* * *

THE position of Manager of Raw Materials Supply has just been established at Armco.

* * *

CHARLES BECK first became associated with the company as a vacation worker while attending Purdue University. Upon graduation with a degree in Mechanical Engineering, followed by a postgraduate course in Metallurgy at Ohio State University, he joined the Armco organization on a full time basis in 1926, working at the company's blast furnaces in Columbus.

* * *

C. C. Walker Appointed General Manager Of G-E Construction Unit

CLARENCE C. WALKER, formerly **General Electric** commercial vice president assigned to customer relations work in the New England area, has been appointed general manager of the company's Construction Materials Department, it was announced by Charles E. Wilson, president of the company.

* * *

MR. WALKER, who will make his headquarters in Bridgeport, succeeds **Carroll D. Hepler,** who died in September. In his new position, he will be responsible for the development, manufacture and sale of wire and cable, wiring devices, accessory equipment and conduit products.

* * *

MR. WALKER joined the General Electric Company in Cleveland in 1921 and was for the next 12 years connected in various capacities with the Bryan Marsh division of the Lamp Department.

* * *

IN 1933 he was transferred to Boston as assistant manager of the Lamp Department's New England sales district, and five years later was named manager.

* * *

HE was appointed commercial vice-president for General

Patented

2 BX Mossberg Carrier

MOSSPEED BRAIDER CARRIERS

Represent

Improved Braiding at Lower Costs

The patented MOSSPEED spring tension take-up makes it possible to increase the speed of the maypole-type braiding machine. An effective increase of 80% being obtained in many cases.

The new (x) type MOSSPEED high speed carrier permits the rapid changing of tension springs making this an ideal carrier for braiding all kinds of yarn (cotton, rayon, asbestos, jute), in addition to fine strands of copper wire.

Consult our engineers regarding your braiding problems.

2 SE Copholder

Complete line of both MOSSPEED carriers and metal copholders for all sizes and makes of maypole type braiding machines.

MOSSBERG

Pressed Steel Corp.

Attleboro, Massachusetts, U. S. A.

18 West Street

James Day (Machinery), Ltd., "Ford House," 88 Regent Street, London, W. I., England.

Electric in Boston, December 31, 1947.

★ ★ ★

E. E. Bradberry Named At Jessop Steel Co.

E. E. BRADBERRY has been appointed assistant manager of sales in Chicago by the Jessop Steel Company. His offices are at 332 South Michigan Avenue, Chicago, Ill.

★ ★ ★

MR. BRADBERRY was formerly stainless sales engineer in the Chicago office of Carnegie-Illinois Steel Corporation.

★ ★ ★

James R. Longwell & F. C. Ritner Advanced by Carboloy Co.

JAMES R. LONGWELL, for the past 4 years Director of Engineering and Research, Carboloy Company, Inc., Detroit, has been named Assistant to the President, and **F. C. Ritner** has been appointed Vice-President in charge of Engineering and Research, according to W. G. Robbins, Carboloy President.

★ ★ ★

MR. RITNER, an engineering graduate of Oregon State College, joined the Carboloy organization in 1929 and has been active not only in engineering but also in sales, service, and industrial relations capacities. He was named Vice-President in 1948.

James R. Longwell, Assistant to the President, Carboloy Co., Inc., Detroit, Mich. * *

★ ★ ★

MR. LONGWELL joined the Carboloy organization 19 years ago and has served successively as Development Engineer, Chief Engineer, Factory Manager and Director of Engineering and Research.

★ ★ ★

THE appointments, according to Mr. Robbins, are in line with the expanding management, engineering, and research functions of the Carboloy organization resulting from the rapid growth in use of hard metals for all kinds of applications, including not only all types of tools and dies, but also in manufactured products in which it is desired to reduce wear in service.

★ ★ ★

The SPECIALISTS in Wire-Straightening and Wire-Cutting!

Diameter Range — 1/16" to .005"

PRECISION - Our Motto

DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

ASK ABOUT OUR UNEXCELLED FACILITIES FOR CLEANING AND POINTING WIRE ALREADY STRAIGHTENED AND CUT.

ALL TYPES OF WIRE...

- Nickel
- Stainless Steel
- Bronze
- Brass
- Copper
- Alloy Wire
- Music Wire
- Tag Wire
- Florist Wire

Write us today!

Manufacturers of the famous ARMA PAPER CLIP

PITTSBURGH CUT WIRE COMPANY

1112-20 GALVESTON AVENUE · PITTSBURGH, PENNSYLVANIA.

TELEPHONE: CEdar 4702

Robert M. Akin

IT is with deep regret that we announce the death on November 11th of Robert M. Akin, Chairman of the Board of Directors and former president of the Hudson Wire Company of Ossining, N. Y.

* * *

MR. AKIN was one of the prominent figures in the early development of the Brass and Copper Industry in the Connecticut valley.

* * *

THE sympathies and regrets of his many friends are extended.

* * *

Sir Peter Rylands, Bart.

OUR many friends and readers throughout the world will note with regret the death of Sir Peter Rylands, Bart., which occurred on Friday, October 22, 1948, on the eve of his eightieth birthday.

* * *

IN the industrial world he was a national figure and his public works in the Warrington District cover a wide field.

HIS baronetcy was, in fact, conferred in the New Year Honours of 1939, "for political and public service in Lancashire and Cheshire" — services which played a notable part in the development of the district.

* * *

SIR PETER'S progressive views played their part in shaping the evolution of the iron and steel industry. As far back as 1900 he was chosen for the presidency of the Steel Wire Manufacturers' Association—and he was president of the Federation of British Industries during the post-war period 1919-21, receiving his knighthood in the latter year. An unprecedented event in the Federation's history was Sir Peter's re-election to the presidency. * * *

HE was president of the Iron and Steel Institute 1926-27, and for 37 years was president of the National Federation of Iron and Steel Manufacturers' Association.

* * *

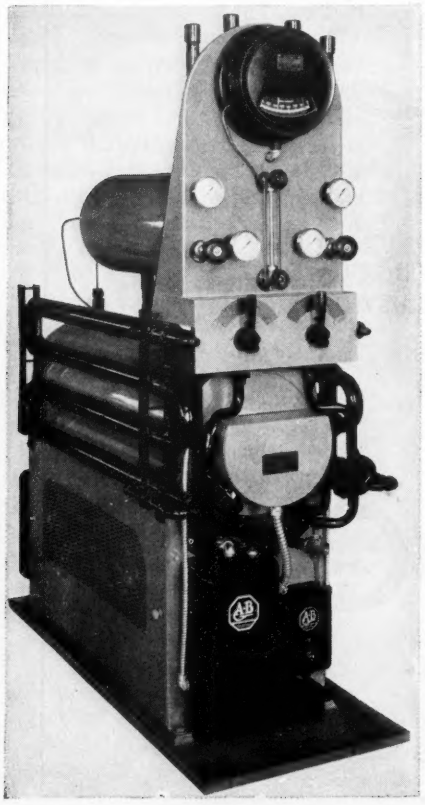
THE youngest son of the late Mr. Peter Rylands, M.P., for Warrington from 1868 to 1874, and later for Burnley, William Peter was educated at Charterhouse and Trinity College, Cambridge. After a successful scholastic career, he elected to enter the legal profession, being called to the Bar (Inner Temple) in 1894.

* * *

AFTER practising in patent law in London until 1898, Sir Peter was prevailed upon to enter commercial life and take an active part in the management of Rylands Bros., Ltd., which firm was founded by his ancestors as far back as the 17th century. The founders, John and William Rylands, started at Culcheth with the weaving of linen thread into fabrics. In the middle of the 18th century, Mr. Peter Rylands, a direct descendant of the founders, moved the business to Wigan, and opened a branch in Warrington.

* * *

IN 1805, the firm, then known as John Rylands and Son, entered the business of wire making, and later wire completely superseded linen thread and sailcloth. With Sir Peter as the guiding force in the last half-century, the firm became the leading organization of its kind in the wire and steel industry.



THE ROYLE TEMPERATURE CONTROL UNIT

For Extrusion and Other Industrial Uses

A compact, simply operated unit designed to sustain any pre-determined temperature between 90°F and 475°F.— Hand-lever selection of desired temperature — Heat supplied — or drained —according to operational requirements — Formed piping, elimination of gaskets, and drip pans promote cleanliness — Breakdown of heat transfer oil reduced to a minimum — Two standard sizes 32KW, 48KW— Other units with water circulation and refrigeration for operations requiring constantly maintained lower temperatures, 35°F to 200°F.

JOHN ROYLE & SONS ROYLE PATERSON N. J.

PIONEER BUILDERS OF EXTRUSION MACHINES SINCE 1880

London, England James Day (Machinery) Ltd REgent 2430 — Home Office E. B. Trout J. W. VanRiper SHerwood 2-8262 — Akron, Ohio J. C. Clinefelter JEfferson 3264 — Los Angeles, Cal. H. M. Royal, Inc. LOgan 3261

PATERSON 3, NEW JERSEY

A Review of Recent Wire Patents

No. 2,450,428, STRIP FORMING APPARATUS, patented October 5, 1948 by Clarence W. Hazelett, Greenwich, Conn.

More specifically the invention concerns cooling means for metal strip forming machines. There are 13 claims.

* * *

No. 2,450,429, ELECTRICAL CORD, patented October 5, 1948 by George E. Henning, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

A pair of wire conductors are enclosed in separate coverings of insulating material served around the stay cord in parallelism, the specific lays of the coverings and stranded cotton thread serving to prevent cutting of the coverings by the threads.

* * *

No. 2,450,876, WIRE TWISTING DEVICE, patented October 12, 1948, by Svend G. Blumensaadt, Beachwood Village, and Frank A. Bielak, Fairview Village, Ohio, assignors to Universal Wire Spring Company, Cleveland, Ohio, a corporation of Ohio.

This device is adapted to twist the connecting wire portions of adjoining left and right hand loops of corrugated wire strips. There are 26 claims.

* * *

No. 2,450,920, WIRE CUTTING AND BENDING PRESS, patented October 12, 1948 by John A. Shand, West Orange, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Wire carriers are provided and adapted to be moved by actuation of a rock shaft so as to engage the wire between force pins carried by the wire carriers, and suitable anvils so as to produce desired wire bending effects.

* * *

No. 2,451,169, WIRE WINDING AND WELDING DEVICE, patented October 12, 1948, by Frederick T. May, Verona, and Richard A. Rehberg, Livingston, N. J., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania.

The inventors provide new wire winding means for association with an electric welding device.

* * *

No. 2,451,281, RETAINER AND DISPENSER FOR SANITARY TISSUES, patented October 12, 1948 by Henry L. Elfner, Indianapolis, Ind., assignor of one-half to Emil H. Stein, Marion County, Ind.

This device is constructed wholly of a continuous length of wire, bent to shape.

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

No. 2,451,383, WIRE SAW STRAND, patented October 12, 1948 by Pierre de Vitry d'Avaucourt, Bainbridge, Pa.

A twisted wire saw strand is provided, comprising a number of intertwisted wires, all of different diameters.

* * *

No. 2,451,423, ART OF WELDING WIRE-MESH FABRICS, patented October 12, 1948 by Charles C. Wickwire, Cortland, N. Y., assignor to Wickwire Brothers, Inc., Cortland, N. Y., a corporation of New York.

The machine herein disclosed is adapted for welding a continuous weft wire in crossed relation to a warp made up of a series of wires.

* * *

No. 2,451,731, STRAND COILING AND WINDING APPARATUS, patented October 19, 1948 by Daniel E. Hennessy, Petersham, Mass., assignor to Springfield Wire and Tinsel Company, West Springfield, Mass., a corporation of Massachusetts.

A flyer eye is provided which is rotatable about the axis of a non-rotatable, tapered mandrel having an outwardly curved heel. The eye guides the wire from the supply spool to the mandrel and is of sufficiently small size to act as a curling edge. Also included is a sleeve surrounding the mandrel between the mandrel and the spool and having a

(*Please turn to page* 1168)

Wire Association 1948 Convention

(*Continued from page* 1141)

ously removed and replaced under the action of a wearing influence and the process is one of attrition taking place in a severely embrittled film. In his opinion the so-called work hardened films differ substantially from those mentioned in his report. They consist of a hard, brittle, martensite produced by frictional heat. Where they occur rapid destruction of the rope follows. **Mr. Brown** maintained that a careful selection of the wire manufacturing process in relation to the conditions of usage of wire ropes is desirable if the maximum service is to be obtained from them.

★ ★ ★

EXCEPTION was taken to some of the data presented in Mr. Brown's paper by **Kenneth B. Lewis,** Consulting Engineer, Worcester, Mass. He insists that stresses in the wire arise in the cone of the die as the wire undergoes reduction. He cited two kinds of stresses which enter into the drawing of wire according to many British wire makers, namely radial compression stresses and tension stresses. In the opinion of **Mr. Lewis** there is only one system of stresses in the cone of a die, namely radial compression stresses. He admitted that there are two schools of thought concerning this matter but he made it plain that in his mind, there was only one type of stress as he pointed out.

★ ★ ★

AT the Wire Association luncheon, Wednesday afternoon, **C. L. McGowan,** Superintendent Wire Mill, Atlantic Steel Co., Atlanta, Ga., presented the **Mordica memorial lecture.** His paper covered details of early wire drawing practice in the United States and no one is better qualified to present a paper of this type than **Mr. McGowan** whose affiliation with the industry covers many decades.

★ ★ ★

THE speaker after giving an account of his early association with the late **John Mordica,** paid tribute to him by saying that no man has done so much for the wire industry in this country as did **John Mordica.**

★ ★ ★

IN relating incidents in the early days of wiremaking in this country, **Mr. McGowan** stated that wire drawers had to have their beer because of lime dust in the drawing room and they would walk a mile from the mill to get it. Management, recognizing the lost time involved, had the foamy broth brought to the plant and dispensed it in the proportion of one glass for each hour worked by the men. This, the speaker mentioned with a twinkle in his eye, was the first occurrence of the Incentive System.

★ ★ ★

SOME of the familiar names which appeared on the payrolls were **Frank H. Nullmeyer, James Farrell** and his **brother Bill.**

★ ★ ★

THURSDAY PAPERS

For Efficient Pickling USE Rodine®

The World's Standard Inhibitor...!

Rodine in the pickle bath—either batch or continuous—means improved pickling and lower costs because "Rodine" . . .

CHEMICALS ACP PROCESSES
RUST PROOFING AND PAINT BONDING
Granodine ®
Duridine ®
Aludine ®
Lithoform ®
Thermoil-Granodine ®
RUST REMOVING AND PREVENTING
Deoxidine ®
Peraline ®
PICKLING ACID INHIBITORS
Rodine ®

SAVES both acid and metal
PROMOTES scale removal
PROLONGS the life of the pickle bath
PREVENTS over-pickling
REDUCES hydrogen embrittlement
PRODUCES cleaner, brighter, smoother surfaces
MINIMIZES acid fumes
IMPROVES working conditions
BOOSTS pickling production

"Rodine" more than pays for itself in savings of acid and metal.

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

Formation and Properties of Martensite on the Surface of Rope Wire by J. H. Corson, Research Engineer, John A. Roebling's Sons Co., Trenton, N. J.

THE author explained that martensite only occurs in the wire crowns of a rope in service and is associated with abrasion in which frictional heat is generated. He emphasized that if the abrasion is insufficient to cause an increase in temperature above the lower critical point, martensite cannot form. He declared that if a thin layer of metal on a rope wire crown is heated above the upper critical temperature that full martensitic hardness will be attained upon cooling. He expressed the belief that the formation is solely dependent upon the temperature to which the surface is increased by friction and not at all affected by the method of manufacture or the chemical analysis within the range of 0.40 to 0.85 per cent carbon rope wire steels. Any differences in the service life under conditions where martensite is present, he stated, are solely dependent on the properties of the martensite.

* * *

MR. CORSON presented data to show that the higher carbon martensite cracks on bending depending on the severity of bending and the carbon content. He pointed out that steel rope wire of 0.55 per cent carbon and lower tearing rather than cracking occurs in the martensite and that these steels require considerably more bending than those of higher carbon content.

* * *

TESTS, which the author described, suggest that where service conditions tend to form martensite, the damaging effect of it can be reduced by lowering the carbon content. If the carbon content is 0.55 per cent or lower, the author asserted that the danger of broken wire from martensite formation is greatly reduced.

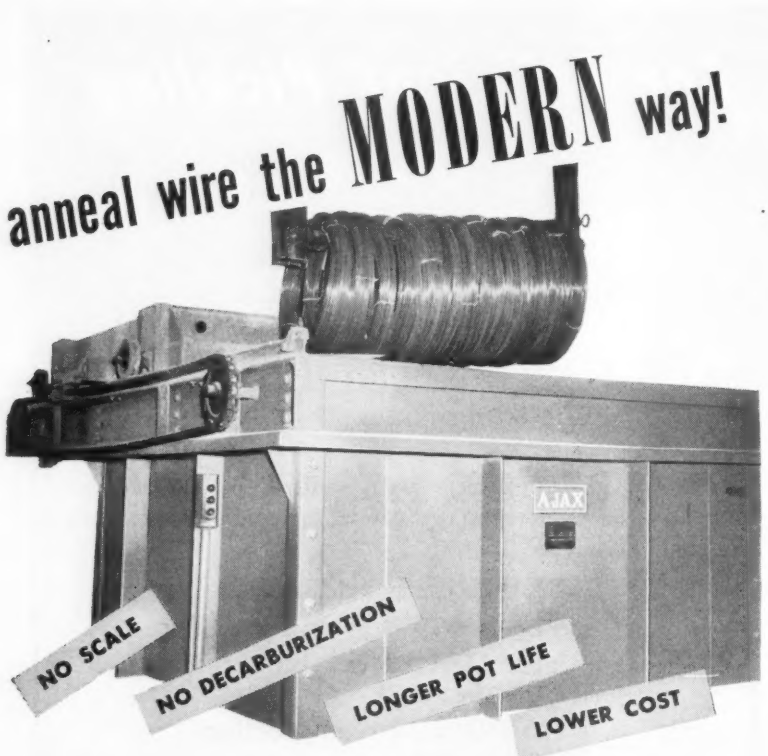
* * *

Quality, Quantity and Service by N. T. Nelson, Jr., Ind. Engr., Rod and Wire Mills, Bethlehem Steel Co., Sparrows Point, Md.

THE speaker predicted that wire mill men are entering into a new era and he emphasized that the mill which makes good wire and gets it into the hands of the customer late is going to lose out in the long run. Uncoated wire is perishable and must be gotten into the point of consumption as quickly as possible. He stressed the importance of getting the finished wire into the plant of the customer on the day the shipment was promised. By methodically expediting the product in the wire mill from one station to another there will be no occasion for backlogs and therefore order books will be much more current.

* * *

THE speaker described a method of getting materials to the plant which he termed loading con-



You'll save money, you'll improve efficiency along many lines with the unique Ajax Electric Salt Bath wire annealing method. It requires less floor space, less labor, less maintenance. Heating cycles average less than 20 minutes, even on difficult jobs. There is no scaling, no decarburization, no explosion hazard, none of the bothersome problems entailed with atmosphere equipment. Salt bath treating does the work faster, better, cheaper!

Ideal for annealing low- or high-carbon and stainless steel wire and rod; annealing aluminum, and copper and silver alloys; and for descaling stainless and alloy steel wire in molten salt baths.

AJAX ELECTRIC COMPANY, INC.
Frankford and Delaware Aves. · Phila. 23, Pa.
The World's Largest Manufacturer of Electric Heat Treating Furnaces Exclusively

WRITE FOR YOUR COPY!
This 72-page Ajax booklet tells the entire story of salt bath heat treatment as applied throughout modern industry. Ask for Booklet 116.

AJAX HUEGREN ELECTRIC SALT BATH FURNACE

trol and by this means of control he made it plain that it is possible to predict six weeks in advance whether or not an overload occurs in the annealing, patenting or any other section.

* * *

WHEN an underload exists, the speaker declared, orders are not sold to the consumer. The sales department is advised of this condition and is requested not to sell this particular type wire until further notice. This, of course, leads to uniform operation throughout the plant.

* * *

IF the mill at any time is improperly loaded, only part of the order will be ready, and this may involve less carload lot shipments with corresponding higher freight rate and because of this situation, the mill may have to stand the added expense. Where the mill is dealing with an order for different sizes of wire and if the wire is not properly loaded according to size ranges, it may be impossible to get out the coarse sizes. Whenever this is the case, only part of the order is ready and the remainder lags behind.

* * *

THE speaker related that the effort with scheduling over a period of two years at his particular mill has penetrated practically to every man at the machine. Because of this, the workman eventually realizes that what he makes today is to be shipped to the customer the next day and that unless this occurs the man in the consumer's plant will not be able to get a day's work. This picture has had a definite, livening and quickening effort on the men in our mill and they have been brought to the full realization that giving a good day's work will count for something to the man the next day in a shop miles distant.

* * *

ONE of the key men in the wire mill today is the product provider. The speaker explained that each provider is charged with the responsibility for causing material to flow to his product on a weekly or daily basis from the next previous operation. He tallys the production and shipment of his product. He may be required to cause materials to flow through his operation for use in filling orders of the provider in the next finishing department down the line, however his main responsibility is for his own shipping products.

* * *

FRIDAY PAPERS

THE morning and afternoon sessions on the closing day of the Convention offered a series of five papers of unusual interest, several new projects being discussed.

Hot Dip Aluminum—Temperatures and Method of Application

CLARENCE ULSHAFER of the **Hughesville Tool and Machine Company** led off with a general presentation of the several efforts so far made to utilize aluminum as a coating metal for steel wire. He reviewed the four principal categories in which the numerous experiments fell, pointing

All Metal

WIRE SPOOLS

Light weight, all-steel, lithographed.
5", 6½", and 10½" diameter ends.
Ends and traverses may be shipped unassembled.

We also produce spools for fine and magnet wire.

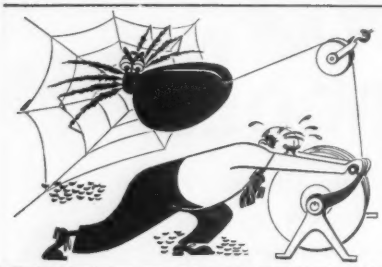
J. L. CLARK MANUFACTURING CO.
600 23rd AVENUE • ROCKFORD, ILLINOIS

out that aluminum has been one metal that has defied most efforts to utilize it as a coating material until recent years. No details were offered as to what made some methods successful today, as those who are achieving good results do not disclose them due to the complicated overlapping patent claims. In the discussion it was brought out that aluminum, because of superior anti-corrosion properties might some day replace zinc, but that much had yet to be done to clarify conflicting patent claims and to disseminate information to prospective users of the processes. One point was clear. The ferrous-aluminum bond is extremely hard and non-ductile and any use of aluminum as coating must employ a relative thin amalgam and thick outer coating of pure aluminum where subsequent wire drawing or forming is contemplated. Die wear, with present lubricants, is also considered to be greater than on a galvanized wire.

★ ★ ★

What's your problem?

Fine Wire? Tungsten? Molybdenum?



Problem 1

The firm of AL LOYS & AL UMINUM were in urgent need of fine aluminum and aluminum alloy wire for a delicate production job. Fine Wire Headquarters assured them that it was no problem at all The order was placed, the Fine Wire delivered, and it performed to the complete satisfaction of all concerned.

Problem 2

Mr. Hi Hott needed molybdenum sheets for forming into parts High hot strength and good ductility were required North American Philips supplied him with Elmet Molybdenum sheets that met his specifications exactly

Problem 3

Mr. N O Emission, II, required plated grid wires. He solved his problem with a call to Fine Wire Headquarters. We shipped him some gold plated tungsten and molybdenum wires. Result: no secondary emission.

the answer

WHY not call Fine Wire Headquarters when you have a question about fine wire? We can't do the impossible, but we can do lots of things that can bring you the right fine wire for the job. So—when you have a Fine Wire problem—wire, phone or write to North American Philips, makers of NORELCO Fine Wires, and ELMET Tungsten and Molybdenum products.

NORTH AMERICAN PHILIPS COMPANY, INC.

Dept. XY-12, 100 East 42nd Street, New York 17, N. Y.

Export Representative, Philips Export Corporation, 100 East 42nd Street, New York 17, N. Y.

The Processing of Brass Wire.

A VERY complete picture of the processes and problems encountered in producing brass wire was given by **Chris Witteveld of the Bridgeport Brass Company**; the term "brass" including all of the high copper alloys, of which his company has thirty standard alloys and many more under development in their laboratories. His company produces rods principally by the extrusion of pre-heated brass, speeds ranging up to 600 F.P.M. In every case, he pointed out, the determining factor as to whether to hot roll or extrude was: (1) the economics involved, and (2) the ability of extrusion dies to withstand heat, which varies widely with differing alloys, and (3) the surface condition that may be produced by extrusion.

★ ★ ★

DISCUSSION brought out that for the majority of the "brasses," the percentage of scrap was greatly reduced by extrusion, which might be 15 to 25% for extrusion as against up to 40% by rolling. Annealing is done in non-atmosphere, batch-type furnaces as experiment and practice have demonstrated that a bright finish can only be produced by a quick acid dip to remove the oxide. Heat treatment to produce uniform grain structure is important, as extrusion produces a wide variation from the first portion of the billet appearing as rod to the last. Most extruded brasses will result in better rod surface conditions than rolling. Due to the large number of brasses produced, the paper was of necessity general, with specific questions answered by **Mr. Witteveld** as to particular alloys.

★ ★ ★

New Materials for Wire and Cable Applications

H. L. Wuerth of the **Geon Division of the Goodrich Chemical Company** provided a glimpse into the future of a number of new developments that may shortly be-

come commonplace applications in the use of synthetic polymers as insulating materials for electric wire and cable. The last ten years have seen these materials developed from practically zero to a general and wide-spread use among manufacturers, in which the polymers fall into six proven classes—styrene, butadiene copolymers, neoprene, eacrylonitrile, polyethylene and polyvinyl chloride.

★ ★ ★

THREE new synthetics were described — a colloidal dispersion of modified vinyl resin in water called Geon Latex 31X. It can be air dried and produces a strong flexible film and is used to protect fibrous braid coverings. A second, Geon Polyblend, is a colloidal blend having the age resistance of polyvinyl chloride and the solvent resistance of acrylonitrile. It can be used as a thermoplastic, vulcanized or used to modify other materials as a tailor-made insulation. A third is Hycar PA, a butadiene type, that exhibits outstanding resistance to flexing, sunlight and ozone. A unique vulcanization process will convert this polymer to a cured product.

★ ★ ★

ALTHOUGH these new materials are now out of the laboratory stage, **Mr. Wuerth** stated that they feel that they have barely scratched the surface in the integration and development of materials yet to come.

★ ★ ★

A Method for Measuring Lubricant Effectiveness in Non-Ferrous Wire Drawing.

A PAPER describing experiments conducted by the **General Electric Company** in measuring lubricant effectiveness in nonferrous wire drawing was ably presented by **C. B. Shopmeyer**, who described a new testing instrument developed in cooperation with them by **Scott Testers, Inc.** With the aid of this machine, studies have been started, but by no means completed, which make possible the simultaneous analysis of both lubricants and dies. In connection with the latter, experiments to date having been confined to diamond wire drawing dies, much data has already been collected on the relative effects of differing entry angles and the length of drawing bearings on power consumption and tendencies to stretch wire. In general, it has been determined that widening the angle beyond 16 degrees or increasing the bearing length beyond 50% of the hole diameter increases the tendency to draw undersize wire and to shorten die life.

★ ★ ★

VARIOUS types of lubricants have been studied that employ animal fats, vegetable oils and stearate bases. Compounds must lubricate, cool, and be free rinsing. It was felt, as evidenced by a lively discussion, that there is a large field here for constructive research and that the same procedures might well be extended to other metals and to carbide dies and that the new die-pull tester opens a wide field of investigation that may well contribute to the knowledge of how to make better wire at lower cost.

★ ★ ★

Inquiry:

Case Number 2

GENTLEMEN:

We would like to get away from wet wire drawing compounds containing soap in one form or another because of staining and foam trouble. It is important that our wire have an exceptionally good surface. Can you help us?

Answer: Our answer to this and similar inquiries is the extensive research program now being conducted by NOPCO* LABORATORIES to effect improvements in NOPCO'S Wire Drawing Compounds.

These improvements include (1) changing the structure of the fats and oils in these compounds, thus enabling them to create a *stronger* bond between metal and lubricants . . . and (2) the production of more *stable* fatty compounds.

NOW IN PRODUCTION. These special research projects *supplement* rather than *supplant* NOPCO'S regular activities in the production of metal working products. NOPCO Wire Drawing Compounds are available now.

Wire Manufacturers: Perhaps we can answer your wire drawing problem. Write us.

*Reg. U.S. Pat. Off.

NOPCO CHEMICAL COMPANY, Harrison, N.J.

FORMERLY NATIONAL OIL PRODUCTS COMPANY

Branches: BOSTON • CHICAGO • CEDARTOWN, GA. • RICHMOND, CAL.

NOPCO — EVOLVED THRU RESEARCH

Fatigue Testing of Wire

AN INTERESTING new angle of research was presented by **F. A. Votta, Jr.**, of the **Hunter Spring Company,** who described a new machine developed by them for the "Fatigue Testing of Wire," the subject of his paper. With this new device, which employs a constant speed synchronous motor to revolve a looped wire through a 180° angle, it is possible to fatigue test wires from .005" to .030" in diameter and determine the fatigue properties of a wire in a few minutes. For example, an .018" sample of music wire, rotated at 14,000 R.P.M.'s will reach a fracture point in a matter of four minutes with a possible error of 1%.

★ ★ ★

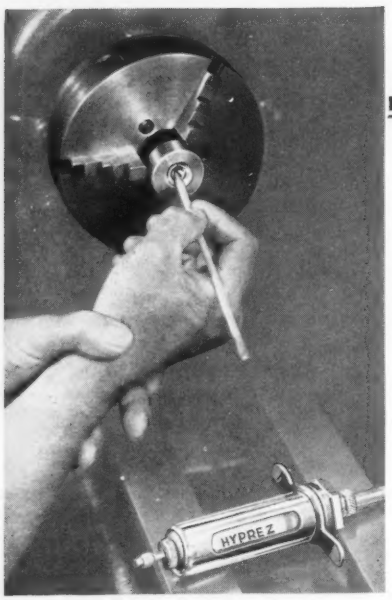
THE device, known as a rotating beam fatigue tester, is particularly adapted to research, to providing standards that will be the basis for customer acceptance and to control charting of wire drawing processes, as besides giving a true picture on good wire, it will show up surface imperfections that will result in wire failures, particularly in spring wire.

BROUGHT out in the discussion was the fact that there seems to be no constant relation between tensile strength and fatigue limits, that while work so far has been limited to determinations on high tensile wires, it has excellent possibilities for use on many non-ferrous wires, low carbon wire and on larger diameter specimens, if and when larger machines are constructed. Much interest in **Mr. Votta's** researches was evidenced, with the feeling that his work is valuable and should be extended to a wider range of metals. The device, it was brought out, has possibilities for use as an inspection tool to detect flaws in dies, to uncover flaws resulting from straightening and cutting operations and to uncover heat-treating and electroplating adverse effects.

★ ★ ★

THIS epitome of Convention activities would not be complete without a word of appreciation and praise for the work of those gentlemen who served as chairmen of the various technical sessions during the five days of meetings. Under their skillful guidance many germane and enlightening points were elicited from floor and rostrum that added materially to the useful information that members could take away for utilization at home.

★ ★ ★



T-C WIRE DIES

Polished to Perfection Quickly and Economically with

HYPREZ
DIAMOND COMPOUNDS

Hyprez Diamond Compounds are formulated of precision-graded, fast-cutting virgin diamond powder in a patented base that will not fly off tool or die and which is stable and uniform at all normal temperatures.

Hyprez is a scientifically balanced product to match your finishing skill—dependably producing a uniform finish.

Hyprez is available in 24 engineered standards, fully color-identified —supplied in dust-proof cartridges and sturdy applicators to eliminate waste.

We will gladly recommend and demonstrate the proper grades for your specific work.

HYPREZ DIVISION
ENGIS EQUIPMENT COMPANY
431 SOUTH DEARBORN STREET • CHICAGO 5, ILLINOIS, U.S.A.

To . . . .

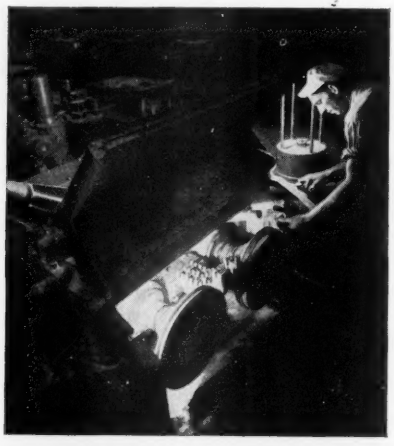
WIRE MILL MEN

Have you considered joining the Wire Association? You are cordially invited to become a member. Dues are $15.00 a year, which includes a subscription to WIRE & WIRE PRODUCTS and a copy of the Annual Buyers Guide.

THE WIRE ASSOCIATION
300 Main Street, Stamford, Conn.

Phosphate Coating Facilitates Wire Drawing and Inhibits Rust

METALLURGISTS of the **Jones & Laughlin Steel Corporation** report that a new phosphate material which inhibits rust and helps lubricate wire in process now permits a 20 to 25 per cent increase in speed of drawing fine high-carbon wire.



Wet-drawing of high-carbon wire on Vaughn machines demands extreme care and rust-free material—not only for sustained high production of wire that meets rigid specifications but also to protect the dies. * * * *

★ ★ ★

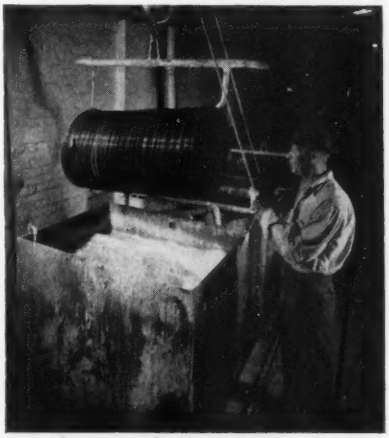
THE new material, known as **"Banox"** and described by the manufacturer, **Calgon, Inc.,** as an amorphous metaphosphate compound, has been in use at J&L's Aliquippa (Pa.) wire mill since June, 1947. Calgon service engineers report this is the first application of Banox in wire-drawing, although it has been effectively employed by manufacturers of household appliances, metal furniture and automotive bodies and parts, as a rustproofing and paint-bonding coating prior to painting.

★ ★ ★

PROTECTION of the wire against rusting while in process not only has permitted an increase in drawing speed but also has meant a sharp reduction in damage to dies and to wire, and fewer delays for replacing and restringing dies, the J&L metallurgists explain.

★ ★ ★

BECAUSE the Banox film deposited on the wire is not water-soluble, and assures a degree of lubrication for the wire in subsequent drawing, the amount of lime picked up to carry lubricant is not critical as in conventional practice, it is added. Formerly, a light coat of lime or a too-heavy "flaky" coat required redipping of the coil; otherwise, too little lime frequently resulted in insufficient lubrication,



View of the cleaning line for high-carbon wire to be reduced to fine gage, at J&L's Aliquippa Works. * * * * * *

WEAN EQUIPMENT Corporation

THE WEAN EQUIPMENT CORPORATION are recognized as specialists in high-efficiency strip and wire mill equipment.

COLD ROLLING MACHINERY

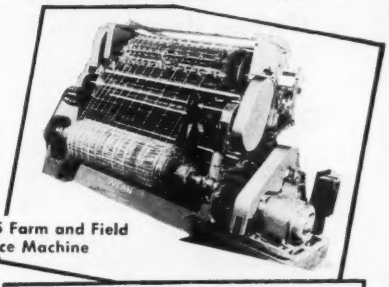
For 36" Wide Material and Narrower

MILLS - REELS - SLITTERS - LEVELERS
COILERS - EDGERS - SCALE BREAKERS - SHEARS
SCRAP BALLERS - CONTINUOUS PICKLING

WIRE MILL EQUIPMENT

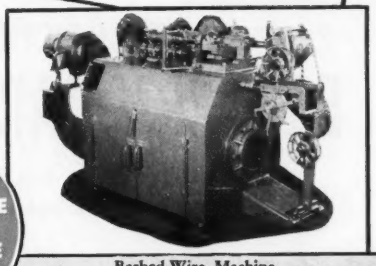
PATENTING, GALVANIZING AND TINNING TAKE-UP FRAMES
WIRE FLATTENING MILLS - SPOOLERS - NAIL GALVANIZING
AND BLUEING EQUIPMENT - FIELD FENCE AND
BARBED WIRE MACHINES

WEAN EQUIPMENT CORPORATION
22800 LAKELAND BLVD • CLEVELAND, OHIO

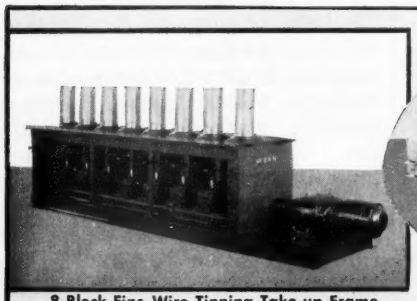


No. 1155 Farm and Field Fence Machine

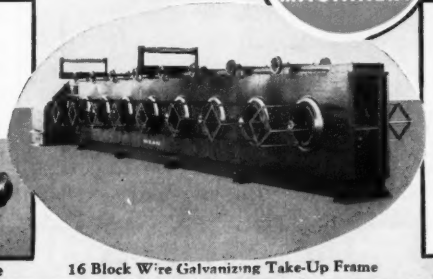
HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY



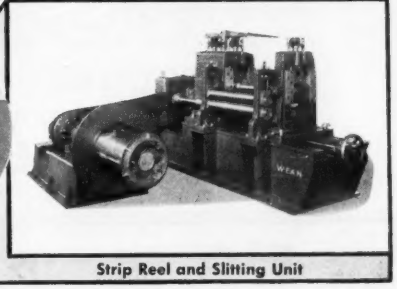
Barbed-Wire Machine



8 Block Fine Wire Tinning Take-up Frame



16 Block Wire Galvanizing Take-Up Frame



Strip Reel and Slitting Unit

with damage to dies and wire, and too heavy a lime coat would flake off, exposing bare wire with much the same results.

★ ★ ★

LESS lime may be used safely when the phosphate material Banox is incorporated in the "cleaning" operation, the J&L men also report.

★ ★ ★

RUST is a particularly serious problem in such a mill, draw bench operators say, because the atmosphere frequently contains corrosive sulphur gases, acid fumes, and moisture. The speed in which corrosion occurs would startle the layman—showing itself in the brief period between pickling and liming.

★ ★ ★

AT the Aliquippa Works the coils of high-carbon wire destined for wet drawing to fine size are dipped successively in an 8 to 10 per cent sulphuric acid pickle; a water rinse; a 1 per cent Banox solution for 4 minutes; another water rinse; and a bath of 8 to 9 per cent hydrated lime. Drying in a flash baker is the final step. This high-carbon material usually is .028" to .066" in size when readied for final reduction on the Vaughn wet-drawing machines. Finished sizes often are on the order of .007."

★ ★ ★

RUST-protection of the wire in process also means that there is less scoring—less brightness of the finished product.

Brightness, to the experienced draw bench operator, is a tell-tale sign of poor lubrication during the drawing operations, and failure to meet the rigid standards of uniform gage which fine high-carbon wire must attain. This type of wire, J&L, metallurgists point out, is commonly used in the making of such products as drag lines, cable and drill rig lines for the petroleum industry, and other wire rope in which strength and uniformity are paramount.

★ ★ ★

STILL another advantage in use of the Calgon rustproofing compound is cited by the steel company men. They explain that when coils of wire stock are dipped in the battery of tanks comprising the cleaning operation, they have an "Achilles' heel"—a small area that does not get the benefit of the acid, water rinse, or lime because the wire is in contact with the yokes on which the coils are raised and lowered. The rustproofing provides some protection and lubricity for these areas which otherwise would be subject to rusting and perhaps cause trouble in further reductions.

★ ★ ★

LIMED coils sometimes must be held in temporary storage until there is room to handle them on the drawing machines. And rust has been a headache, because ordinary materials used for rustproofing washed off in the lime tub. Tests made by the J&L metallurgists in their initial trial of Banox indicated that limed coils treated with this material could be exposed four to five times as long before any rust could be detected.

★ ★ ★

YOUR COMPLETE CARBIDE
REQUIREMENTS
FROM **ONE** SOURCE

DIES

Large stock of rough cored dies. Rough and Semi-finished mandrel nibs, Heading & Extrusion dies, Knives and Quills, Wear Parts and miscellaneous Carbide items can be furnished promptly to your specifications.

TOOLS

Large representative stock of WENDT-SONIS carbide cutting tools including single point tools, Reamers, Drills, Counterbores, etc.

Quotations Furnished on Request

EASTERN CARBIDE CORP.

909 MAIN STREET NEW ROCHELLE, N. Y.

Telephone: New Rochelle 2-6630

Representatives of Hyprez Diamond Lapping Compounds for Your Die Room Needs.

Eastern Distributors of Wendt-Sonis Carbide Cutting Tools.

COMPLETE CARBIDE SALES & SERVICE

COST per ton of wire for use of the new material naturally has varied with the diameters of wire being rustproofed, it is explained, but usually is on the order of $0.15 to $0.35 per ton of wire treated.

* * *

COPPER-FLASHED wire also is effectively rustproofed with the new phosphate compound at J&L. Trouble with sulfiding was practically eliminated. Draw bench operators said the wire which had been dipped for two minutes in 1 per cent Banox solution and rinsed in hot water, drew out more smoothly and rode up the block much better.

* * *

THE coating deposited by a Banox solution, the manufacturer reports, is an amorphous or non-crystalline phosphate with a physical structure much like that of high-polymer resins. It follows the profile of the metal surface in an even and continuous film approximately 15 millionths of an inch thick, imparting no roughness and retaining its flexibility so that it does not crack or flake in further processing of the wire or other metal product or part. Heat is not required for application—an advantage said to have interested several manufacturers faced with fuel shortages — nor is special equipment. Both spray and immersion methods are being employed, service reports indicate. A maintenance problem common to most phosphate coating solutions is eliminated because the Banox solution does not produce a sludge in the tank.

* * *

Ball Bearinged Variable Speed Transmission

A NEWLY designed CUB Variable Speed Transmission has been introduced by the **Standard Transmission Equipment Company** of Pasadena, California.

* * *

MAIN points of improvement over the previous model are the introduction of a hardened and ground shaft rotating in a fully sealed double ball bearing assembly. The two outer pulley flanges are fixed to the rotating shaft with the center pulley floating laterally on a large bronze bushing over the hardened shaft. In the previous design the pulleys rotated on a stationary shaft with oil impregnated bushings as bearings.

* * *

THE new ball bearinged design increases life of the drive and at the same time increases power output through reduction in frictional losses. Bearings are sealed against dust and abrasive conditions and are quiet in operation.

* * *

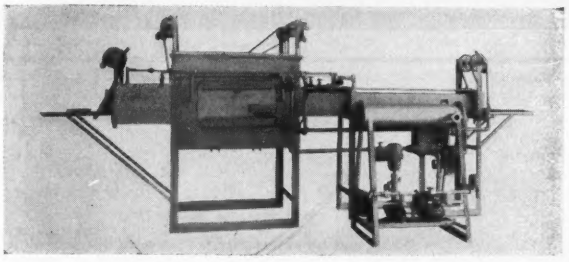
THE CUB Variable Speed Transmission is the smallest of the company's two types and six sizes, and it is especially designed for all applications where a 3.3-1 speed range and "A" Section V belts are sufficient. Construction is of cast iron carefully machined. Base dimensions are 2 ¾ x 7½"; overall width 6½", overall height 9". Speed adjustments are made by means of lever control while machine is in operation.

1926 — pioneered the first practical controlled-atmosphere furnace

"Certain Curtain" ELECTRIC FURNACES

TODAY — providing the most advanced types of controlled-atmosphere furnaces

"CERTAIN CURTAIN" ELECTRIC FURNACES



TYPE LA

For CLEAN annealing, copper brazing, silver soldering in Controlled Atmosphere

The famed "Certain Curtain" control conquered the most difficult atmospheric problems in high speed steel treating. These same patented methods are available in equipment expressly designed for clean annealing, copper brazing and silver soldering at temperatures up to 2000°F. Conveyor and batch types. Additional external atmosphere generator available. "Certain Curtain" equipment dissociated ammonia or hydrogen assuring the utmost in economical protection for every operation.

AVAILABLE ALSO IN CONVEYOR TYPES AND IN VARIOUS CAPACITIES

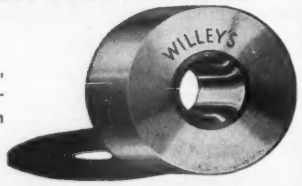
Write for "CATALOG 108"

C. I. HAYES, INC. 129 Baker St., Providence, R. I.

WILLEY'S DIES LAST MUCH LONGER

SPECIFY WILLEY'S SIZING, EXTRUSION and WIRE DRAWING DIES

Pioneers in the manufacture of wire forming dies, Willey's is in position to make dies to your specifications that give superior performance, cut production costs and hold tolerances for long runs.



There are standard one-piece round dies, available from stock in many sizes — as well as four classifications from blank and rough cored nibs to finished dies, ready to use.

WRITE FOR CATALOG

Full information on all sizes and classifications, as well as hundreds of Willey's Tools for other uses.

WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

1342 W. Vernor Highway Detroit 1, Michigan

STATEMENT OF OWNERSHIP, management, circulation, etc., required by the Acts of Congress of August 24, 1912 and March 3, 1933, of Wire & Wire Products published monthly at New York, N. Y., for October 1, 1948.

State of Connecticut, County of Fairfield, ss.: Before me, a Notary Public in and for the State and county aforesaid, personally appeared Richard E. Brown, who, having been duly sworn according to law, deposes and says that he is the President of Wire & Wire Products and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amend.d by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publishers, editor, managing editor, and business managers are:

Pub'isher, Quinn-Brown Publishing Corporation, 300 Main St., Stamford, Conn.; editor, Richard E. Brown, 300 Main St., Stamford, Conn.; managing editor, none; business manager, Ruth E. Spengel, 300 Main St., Stamford, Conn.

2. That the owner is: (if owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern its name and address as well as those of each individual member must be given.) Quinn-Brown Publishing Corporation, 300 Main St., Stamford, Conn.: Richard E. Brown, 300 Main St., Stamford, Conn.; Leta B. Brown, Montecito, California, and Ruth S. Spengel, Shore Front Park, South Norwalk, Conn.

3. That the known bondholders, mortgagees, and other security holders owning or holding one per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given, also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

RICHARD E. BROWN
(Publisher)

Sworn to and subscribed before me this 14th day of September, 1948.

GEORGE W. VEIT,
Notary Public.

My commission expires April 1, 1952

New Industrial Truck Has Extra-Low Platform 12 Feet Long

A NEW power industrial truck with platform 12 feet long and an unusually low-lift for its capacity is announced by **Elwell-Parker Electric Co.,** Cleveland.

★ ★ ★

THIS was developed in solving a problem in manufacture of asbestos board and has been found applicable to a wide range of handling operations. These pertain especially to plants where it is desired to transport close to floor levels heavy loads of materials or products having large surface areas placed on skids or supported on frames mounted on skids, for safety and stability.

★ ★ ★

WEIGHT of truck is 8000 pounds; its load-carrying capacity 20,000 pounds. Length of platform is 144 inches, width 32 inches. Top of platform in lowered position is 11½ inches above floor level, maximum height elevated 17 inches. Platform is raised by means of two cylinders actuated hydraulically, the driver operating these by simple hand-lever control.

★ ★ ★

AN outstanding feature is the multiple (4) sets of wheels under the platform. Hydraulic-power steering mechanism enables the driver without effort to turn the truck in 99½-inch aisle intersections. Truck is powered all-electric or gas-electric. New machines of this basic design now are being supplied.

★ ★ ★

Canadian Members to Hold Regional Meeting

AT the Annual Directors' Meeting of the Wire Association held in April 1948 at New York, the Board of Directors authorized the addition of a Canadian Regional Meeting to the existing schedule of regional meetings of The Wire Association.

★ ★ ★

A CANADIAN Committee was appointed at that time, consisting of Mr. H. B. Carnahan,

★ ★ ★

Works Manager, Canada Wire & Cable Co., Ltd., Toronto—Chairman; Mr. Allan B. Dove, Plant Supt., Dominion Works, Steel Company of Canada, Ltd., Lachine, Quebec; Mr. H. Miller, Works Manager, Wire & Cable Div., Northern Electric Co., Ltd., Montreal; Mr. A. Lauder, Works Manager, Phillips Electrical Works, Ltd., Brockville, Ont.

* * *

THE Committee sent out a questionnaire letter to all Canadian members and the response was to the effect that 79 Canadian members to start with would attend if a meeting were held in Montreal in the Spring.

* * *

THE Committee thereupon selected the Mount Royal Hotel at Montreal as the place of the meeting, and Thursday and Friday, April 28 and 29, 1949 as the dates for the meeting.

* * *

IT WAS agreed that the Regional meeting should be of two days' duration, and the first day should include a plant visit to a steel wire mill followed by a plant visit to a non-ferrous wire mill.

* * *

THE papers presented will be of interest to both ferrous and non-ferrous members, and the following subjects have been suggested:

1. Instrumentation
2. Material Handling
3. Lubrication and Drawing Lubricants

* * *

IN THE near future notices of this meeting will be sent to all members of the Wire Association, and it is hoped that many of our group from the United States will attend this first Canadian meeting.

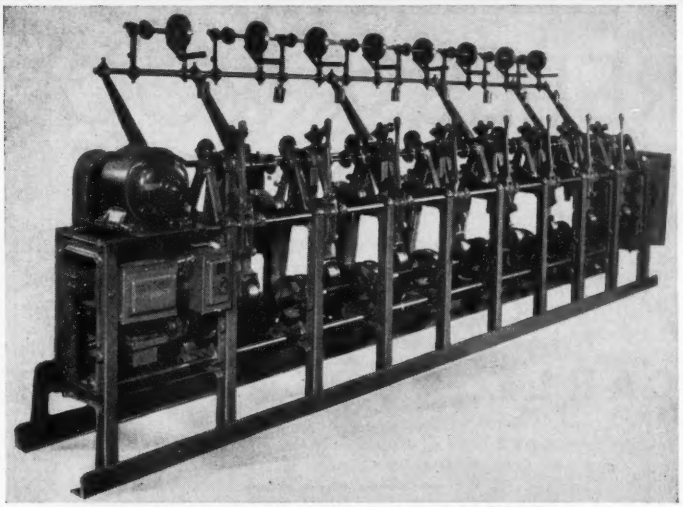
* * *

FROM the plans now in process, the outlook is for a very fine meeting, both from the standpoint of technical papers and plant inspections, and entertainment.

* * *

Don't forget the dates—April 28 and 29, Mount Royal Hotel, Montreal, Canada.

* * *



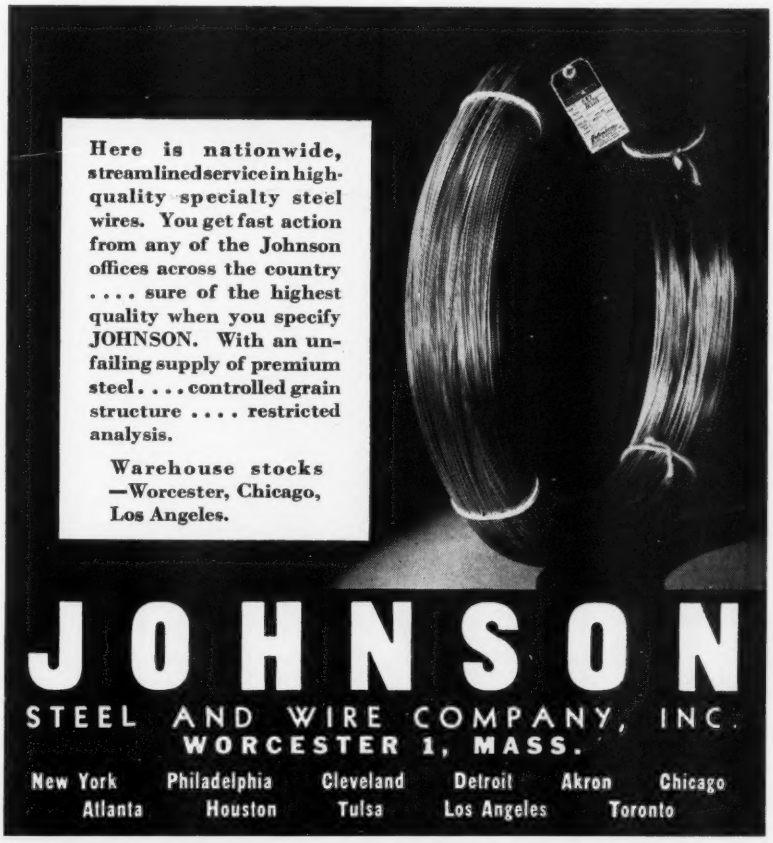
NO. 1900H MULTIPLE SPINDLE SPOOLER

Winds wire with maximum diameter of .080".
Accommodates spools up to 16" flange diameter.
Spool spindles can be started or stopped individually and traverse is adjustable for length over its entire range.
Other spoolers made to accommodate any size of wire and operating condition. Spoolers are also engineered to meet your special needs. Only finest workmanship and materials used.

On Spooling problems consult

ROBERT J. EMORY COMPANY

31 EAST RUNYON STREET NEWARK 5, NEW JERSEY


Here is nationwide, streamlined service in high-quality specialty steel wires. You get fast action from any of the Johnson offices across the country .... sure of the highest quality when you specify JOHNSON. With an unfailing supply of premium steel. . . . controlled grain structure .... restricted analysis.
Warehouse stocks —Worcester, Chicago, Los Angeles.
JOHNSON
STEEL AND WIRE COMPANY, INC.
WORCESTER 1, MASS.
New York Philadelphia Cleveland Detroit Akron Chicago
Atlanta Houston Tulsa Los Angeles Toronto

REELS OF WOOD

RETURNABLE and NON-RETURNABLE

Furnished assembled or knocked down, made to your specifications. Will withstand severest handling. Sturdy, strong, low in cost. Made for

CABLE, ROPE and WIRE

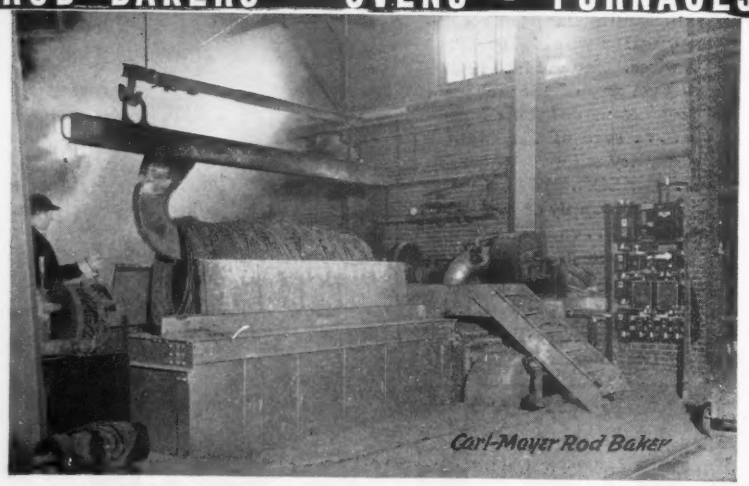
in any size from 12″ to 96″ in diameter.

ALSO, REEL HEADS FOR STEEL DRUMS

Send us your specifications and let us quote on costs.

BRIDGE MFG. CO., Inc.
HAZARDVILLE • CONNECTICUT

MORE PRODUCTION *with* CARL-MAYER HI-SPEED ROD BAKERS - OVENS - FURNACES



Patented
TYPICAL HI-SPEED ROD BAKER — DIRECT OR INDIRECT HEAT — ANY FUEL
WRITE for BULLETIN No. 241

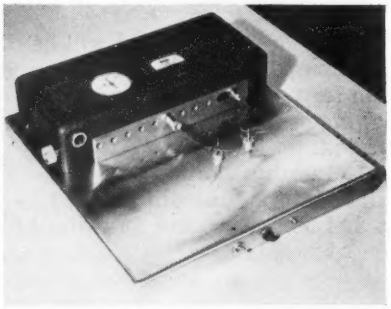
Growing interest in our type of equipment is evidenced by Carl-Mayer installations for such plants as:—

American Steel & Wire Co.
Atlantic Wire Co.
Atlas Steel Co.
Atlas Tack Corp.
California Wire Cloth Corp.
Eaton Mfg. Co.
Frost Steel & Wire Co. Ltd.
Hollup Corp.
Johnson & Nephew Ltd.
Jones & Laughlin Steel Corp.
Pittsburgh Tool Steel Wire Co.
Republic Steel Corp.
Steel Co. of Canada
Wickwire Spencer Steel Div.
Page Steel & Wire Co.

THE CARL-MAYER CORPORATION
3030 EUCLID AVENUE
CLEVELAND, OHIO

New Rotating Beam Fatigue Testing Machine for Wire Offers New Controls in Wire Production and Use.

AN ENTIRELY new development in rotating-beam fatigue testing machines promises to give the wire producer, user, buyer and wire-forms designer fatigue data accurate well within one per cent error, with greater speed than heretofore obtainable. The instrument permits new applications of fatigue knowledge to industry's daily chores—such as: (1) control charting of wire drawing processes, (2) wire acceptance on the basis of statistical analyses of fatigue data, (3) studying variations of fatigue characteristics throughout a wire lot, (4) research studies in the fatigue field, (5) predicting wire life in dynamic service — a quality control characteristic, (6) using fatigue strengths and endurance limits as quality indexes, (7) more efficient determination of safety factors in design, and (8) determination of fatigue characteristics of small wire as a basis of design involving wire forms and parts.



Fatigue Testing Machine * * * *

★ ★ ★

THE tester was developed by the **Hunter Spring Company** of Lansdale, Pennsylvania. Its design involves looping a sample of predetermined length through a complete 180 degrees so that the bending stress (at the peak of the loop) can be perfectly predicted, simply calculated and brought to as great a value as desired in order to hasten specimen failure. The machine is adaptable to wire from 0.005″ to 0.030″ in diameter. Other methods cannot be used for wire sizes under .020″, as larger sizes cannot be reliably stressed at

high levels for speed testing. The apparatus is said to be so simple that operators with no experience in operating physical testing equipment can perform the necessary calculations. There are no fine adjustments to be made and no special precautions in the maintenance and handling.

* * *

THE instrument consists of a motor driven chuck (3600 rpm) and bushings to position that end of the sample which is not clamped in the chuck. The bushing can be positioned with vernier accuracy to .001". Two supporting guides mounted on Alnico magnets hold the specimen in a horizontal plane, prevent vibration, and can be quickly but securely positioned anywhere on the steel apron of the instrument.

* * *

REVOLUTIONS of the synchronous motor are counted by a Telechron timer read in tenths of a minute. The test is automatically terminated as the specimen breaks and actuates an electronic circuit to stop the motor and the timer simultaneously.

* * *

THE instrument is 17′ x 18-13/16″ x 5-3/16″—flat in design for easy rack mounting, so that a compact bank of several units can be racked for conducting many tests at once.

* * *

INQUIRIES for further details, Apparatus Division, Hunter Spring Company, Lansdale, Pennsylvania.

* * *

FOR SALE

2—5 DRAFT MORGAN CONNER WIRE MACHINES
1—VERTICAL TYPE HEAVY WIRE DRAWING MACHINE
1—HORIZONTAL TYPE HEAVY WIRE DRAWING MACHINE
ALL ELECTRICAL EQUIPMENT INCLUDED.
GOOD WORKING CONDITION.
IMMEDIATE DELIVERY, INSPECTION CAN BE MADE.

WALTER R. SHIRLEY
1803 Investment Bldg.
Pittsburgh 22, Pa.
Grant 3247

Leadership!

PLASTICS EXTRUDERS
CONVEYORS
WIDE SHEETING DIES
MONOFILAMENT EQUIPMENT
FILM WINDUPS
CAPSTANS
TAKE UPS
CROSS HEADS FOR WIRE COVERING
STRIPS
TUBING
RODS
GRANULATORS
PELLETIZERS
etc.

THRU SPECIALIZATION
From a special DIE..... to a complete extrusion PLANT

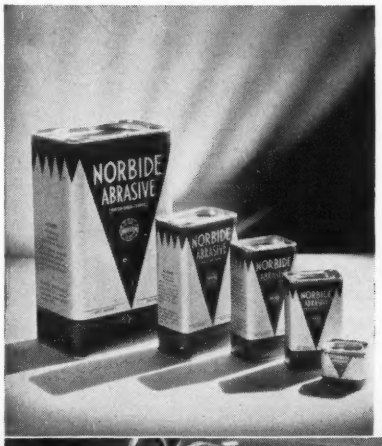
Modern engineering and the sturdy craftsmanship built into every unit has made MPM a leader in its field. Practically all material suppliers' laboratories and technicians have approved and installed this equipment.

MPM's understanding of the technical problems of other lands has made it the world's largest exporter of extruding machinery. One of America's progressive firms helping rebuild the industrial potential of other lands—making more and better products for better living.

Many domestic and foreign shipments include all equipment required (including dies) for the production of customers' product.

Send for illustrated brochure
15 UNION ST., LODI, N. J.

modern plastic machinery corp. mpm
GREATER Flexibility = MORE PROFITS!
SEND FOR BROCHURE
15 UNION ST., LODI, N. J.
CABLE ADDRESS MODPLASEX



NORBIDE ABRASIVE
For Cemented Carbide Dies

NORBIDE Abrasive is successfully used for cutting and semi-finishing cemented carbide wire drawing dies. This abrasive is second only to diamond powder in hardness and is 150 times less expensive. Sizes 220 and 240 for ripping; 320F for semi-polishing; 500 to 800 for final finishing.

NORTON COMPANY
WORCESTER 6, MASSACHUSETTS

NEW — AND BETTER

PATENTING
TEMPERING
ANNEALING

The *Trauwood* PROCESS

OUTSTANDING ADVANTAGES

Higher and more uniform physical and fatigue properties.

No surface decarburization or scale.

Faster wire speeds . . . greater production.

Equipment fully automatic and easy to operate.

Control of heating and cooling cycles extremely accurate.

Thermal efficiency of the process very high.

Much finer grained structure possible.

High quenching temperatures rapidly attained.

Adaptable to high alloy and austenitic steel wire and strip (annealing of stainless).

The Trauwood Process, new in principle, eliminates high temperature furnaces and lead pots with their excessive maintenance costs and low thermal efficiencies. More positive temperature control is possible and quenching is done in a RISING temperature—instead of falling, as in conventional heat treating methods. The rapid rate of heating (4 to 5 times as fast as furnace heating) increases production and uniformly produces a finer grained product with higher physical and fatigue values.

Wire and rod patented by the Trauwood Process insures easier drafting and makes heavier reductions possible. In conjunction with the Trauwood patenting equipment, pickling, coating and baking can be made continuous, eliminating expensive handling and delay, materially reducing costs as compared with ordinary methods.

Complete details of the Trauwood Process will be furnished you on request. Our engineers will help you solve your continuous wire and strip patenting, tempering, and annealing problems. Write today.

THE TRAUWOOD ENGINEERING COMPANY

15200 BROOK PARK RD., Box 2719, Westpark Station, CLEVELAND, OHIO

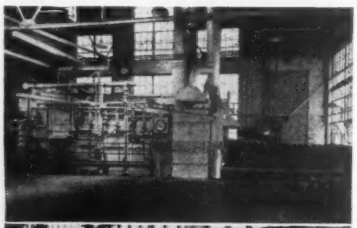
British Representative:

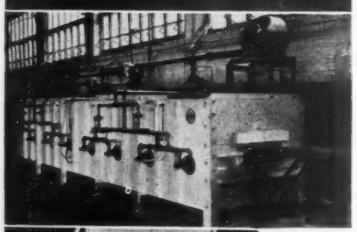
JOHN RIGBY & SONS, LTD., LOW MOOR, BRADFORD—YORKS, ENGLAND

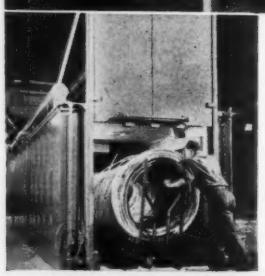
For Treating Bars, Rods, Wire, Strip, Springs

install

ROCKWELL FURNACES OVENS • BAKERS SPECIAL MACHINERY







Top — Pusher type furnace for copper wire bars.
Middle—Continuous furnace for bright annealing wire.
Bottom — Tunnel type; oven for baking on wire.

- Rockwell batch or continuous, direct, muffle or radiant tube furnaces of all types for metal heat treating.
- Gehnrich ovens, batch or conveyor types, for aging, normalizing, drawing, baking finishes and protective coatings, and lime on wire rods.
- Coil winding machines, reels and spools; pickling, brushing, cleaning, washing, finishing, drying and handling equipment; special fabrications.

We also design non-ferrous rod mills.

Write for Bulletins

W. S. ROCKWELL COMPANY

242 ELIOT STREET • FAIRFIELD, CONN.

Government Information

(*Continued from page* 1146)

tive of the twelve radius measurements. These methods, which were used in the cases where averaging the measurements would have resulted in a loss of sensitivity, are valid only for uniaxial stress in the surface of the specimen.

★ ★ ★

IN ORDER to calibrate the method, tests were made on a flat steel specimen loaded in bending to produce a tensile stress in the surface under examination. The actual strain in the surface of the specimen was measured with wire strain gages placed above and below the spot which was irradiated with X-rays. The results obtained on which the values obtained from measurement of the diffraction ring are plotted against the surface strain. Each of the points represents data from one diffraction pattern, the open circles being for patterns taken with the incident beam normal to the surface, the closed circles with 45° incidence. The direction of change of 0 is different in the two cases because the lattice contracts in directions at right angles to the applied stress.

★ ★ ★

A SIGNIFICANT fact is revealed by the curve for 45° incidence which flattens out at a strain value of about 9×10^{-4}, indicating that plastic deformation occurred when the strain was greater than this value. However the 90° curve shows no flattening up to the maximum applied strain. From this it appears that plastic deformation in one direction in a crystal does not affect the atomic spacing or elastic properties in other directions where the strain is not great enough to cause slip. Such results suggest that the measurement of lattice strain by means of X-rays might provide a powerful tool for the investigation of the mechanism of plastic deformation.

★ ★ ★

[1] For further technical details, see "Calibration of X-ray measurement of strain," by John A. Bennett and Herbert C. Vacher, J. Research NBS 40, 285 (1948) RP1874.

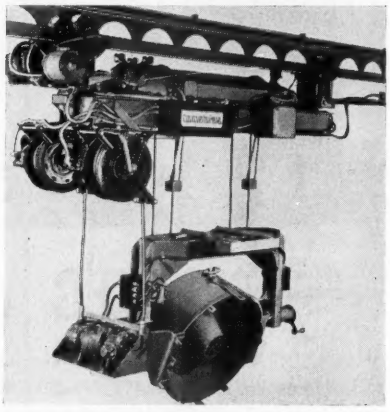
★ ★ ★

IN ORDER to obtain a single value representative of the lattice strain, the difference between the values of 90° and 45° was used. The relationship between this difference and the measured surface strain was found to be linear, the maximum deviation of any point from a linear relationship corresponding to about 1000 lb./in² stress.

* * *

Automatic Chip—Handling Carrier

A NEW automatic overhead carrier has been developed by the **Cleveland Tramrail Division of The Cleveland Crane & Engineering Co., Wickliffe, Ohio,** for transporting baskets of various metal chips from oil extractor to any one of a number of storage



Automatic Overhead Carrier * * * *

bunkers. The carrier delivers empties by turning the basket over, and returns, automatically without operator accompanying. All operations are taken care of by one man at extractor.

* * *

BASKETS of approximately 15 cu. ft. capacity, which take 1000 lb. loads of chips are handled with this carrier. They are clamped into position by a hand crank and turn over automatically at a speed of 12½ r.p.m. at destination.

* * *

A DIAL selector, located just above the crank, enables the preselection of any station to which it is desired to dispatch a load.

Sjogren . . . **WEDGE GRIP**

Used by Wire Men Who Want the Best!

SJOGREN TOOL AND MACHINE CO., INC.

WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • CAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS •

14 SWORD STREET AUBURN MASSACHUSETTS

If it's twisted folded pressed crushed shaped braided woven **paper**

TWITCHELL makes it

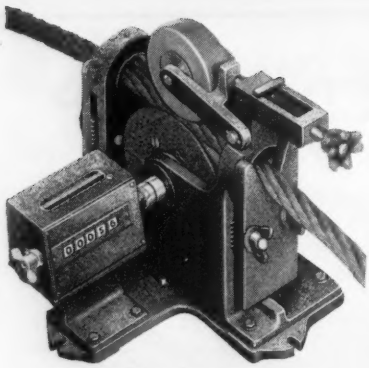
fine, treated yarns wound 4 ends parallel for high-speed wrapping by new Abbo-sealed process will be available soon.

waxed cable-filler for 2- and 3-wire non-metallic sheath cable and ship-board cable.

wire-rope cores

braiding and wrapping yarns for electrical cable.

E. W. TWITCHELL INC.
Third & Somerset Streets, Philadelphia 33, Pa.



Model L-20—double worm drive for smooth, continuous operation—subtracts when reversed.

Mile-a-Minute

COUNTING

The Productimeter illustrated above will measure wire up to 1½" diameter at speeds of 5000 feet per minute — nearly a mile a minute. Exclusive features assure accuracy and long life for these precision instruments. Speed and assured accuracy are absolutely necessary to prevent losses in wire manufacturing or handling. Also models available to measure wire down to .010 in.

Send for Catalog No. 40.

DURANT MFG. COMPANY

1918 N. Buffum Street, Milwaukee 1, Wis. — 118 Orange Street, Providence 3, R. I.

Representatives in Principal Cities

Model L-HDW-16-Q

Available for direct and predetermined measurement. Models furnished with Quick Lever Reset for instantaneous resetting.

PRODUCTIMETERS SINCE 1879 — Speedometers OF INDUSTRY

This particular selector will serve systems having up to 400 stations.

* * *

THE unit has three motors which serve the hoist, the carrier travel and the basket rollover. There are two cable take-up reels; one for power to the rollover motor and the other for control circuits. The carrier will not travel unless basket grab is in high position; this necessitates operator keeping "hoist" button depressed until upper position has been reached, whereupon carrier is set in motion automatically. Travel speed of carrier is 200 f.p.m.

* * *

A Review of Recent Wire Patents

(*Continued from page* 1152)

free end positioned in the path of the wire between the flyer eye and the mandrel to direct the wire to the heel.

* * *

No. 2,451,780, FLEXIBLE MESH BRACELET AND METHOD OF MANUFACTURE, patented October 19, 1948 by John G. Siska, North Cresskill, N. J., assignor to Jacques Kreisler Manufacturing Corporation, North Bergen, N. J., a corporation.

The Bracelet comprises a series of spiral wire elements arranged side-by-side with the convolutions of adjacent elements interlaced with each other for pivotal connection of the latter, and the interlaced convolutions of adjacent elements being, at their intersections, mutually deformed into mutual limited interlocked relation to prevent relative movement, other than restricted pivotal relative movement, between the adjacent elements.

* * *

No. 2,452,155, WORKING THE DIE HOLE CONTOUR OF A WIRE DRAWING DIE, patented October 26, 1948 by Walter Rybicki, Garfield Heights, Ohio.

This assembly includes a wire drawing die holding and rotating device adapted to rotate the die about its axis in a tilted position, a spindle having an end for mounting a tool for working the die hole contour of the die, a reciprocating surface spaced opposite the face of the die at an elevation holding the spindle tilted when the tool is mounted by the end and is resting in the die hole and this spindle is resting on the surface, this surface comprising a length of flexible material bent around a wheel rotatively journaled by the frame at right angles to the spindle, and means for reciprocating the length of flexible material, the wheel being position so that when the spindle is resting tangentially on the length bent therearound the spindle is held as described.

* * *

An ADVERTISER likes to know his ads have been read so please mention WIRE & WIRE PRODUCTS when writing him.

with **HAVEG**

If you need a non-metallic material with physicals such as strength, toughness, and durability PLUS 100% corrosion resistance, investigate HAVEG.

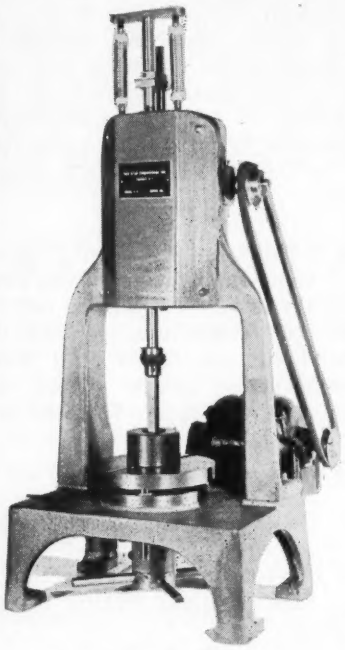
This versatile molded material, resistant to chemical action *throughout its entire mass,* is ideal for structural uses. Tanks, towers, and other large structurally strong equipment can be molded in one piece at nominal cost and delivered in from one to eight weeks.

For complete information on how this unusual material can help improve performance and reduce costs on your applications, drop us a line for HAVEG Bulletin F-5

HA 3-48

HAVEG CORPORATION
NEWARK 47, DELAWARE

CARBIDE DIE SIZING MACHINE



Designed for extra accuracy and for saving time, labor, and money in your die room.

FEATURING . . .

Entirely new and advanced design for tungsten carbide die finishing.

Opens the bearing of a rough die to within .001" of desired finished hole size.

Rigid and perfect alignment of spindle reduces vibration to a minimum; thus laps faster and produces a smooth finish on lapping surface.

Table adjustable for quickly raising or lowering the die to the proper position.

Table slots for clamping the die firmly in place.

Oilite Bushings throughout.

Prompt Delivery.
Reasonably Priced.

Write today for details and prices.

RED STAR ENGINEERING, INC.

P. O. Box 346

RAHWAY, N. J.

EDITOR'S NOTE

Due to the decision on the part of the members and president of the Industrial Diamond Association, the fourth and last of this series of Die letters will be forthcoming at a later date.

* * *

New Catalog Describes Surfacers And Grinders For Specimen Preparation

METALLURGISTS who have to prepare specimens of wire for inspection and analysis will be interested in a new bulletin called "Surfacers and Grinders" that describes a series of new and improved machines designed for laboratory use.

* * *

THOSE desiring copies of this bulletin may secure it by writing **Dept. W., Buehler, Ltd.,** 165 W. Wacker Drive, Chicago 1, Ill.

* * *

Warner

BELL-MINE LIME

for

WIRE DRAWING

WARNER COMPANY

BELLEFONTE DIVISION

BELLEFONTE, PA.

Sales Office

Philadelphia—Pittsburgh—New York

LET

STANNOCHLOR or STANNOUS SULPHATE solve your tinning problems

One of these two M & T chemicals will meet all your liquor finishing or immersion plating requirements . . . whether for acid or alkaline . . . white or bronze finish baths.

STANNOCHLOR and STANNOUS SULPHATE are stable . . . will not deteriorate with age in summer or in winter. Their use makes it possible to keep a stock on hand at all times . . . permits purchasing in large quantities for economy.

And, because they contain no water of crystallization, STANNOCHLOR and STANNOUS SULPHATE go further pound for pound.

Write for more complete information.

METAL & THERMIT CORPORATION

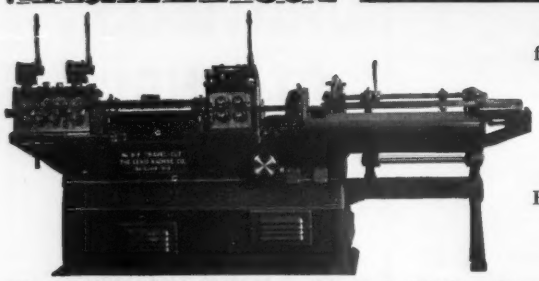
120 Broadway • New York 5, N.Y.

HOWSAM SPOOL COMPANY

500 RATHBONE AVE AURORA ILLINOIS

Phone 2-3043

LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to 3/4" rod
Round
Square
Flat
Hexagon
Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

LEWIS

The LEWIS MACHINE Co., 3445 E. 76 St., Cleveland, O.

REELS SPOOLS

ALL SIZES

WOOD- PLYWOOD -WOOD-METAL

RETURNABLE NON-RETURNABLE

Samples and Prices on Request

DURKEE MFG. CO. PINE RIVER, MINN.

MODERN

SPOOLERS and COILERS

May improve your efficiency in a long forgotten department. We have developed new designs that may reduce your labor costs considerably. Tell us your spooling problem and we will gladly help you benefit from our experience with no obligation on your part.

BOYD-FIDELITY SPOOLERS

Chas. P. Boyd Corp.

1434-38 Callowhill St. Philadelphia 30, Pa.

Labor Relations

(*Continued from page* 1143)

THERE were other decisions which bore home to union men the country over that traditional union practices were being changed by the law. The ban on the closed shop was stirring up opposition through the International Typographical Union strike in Chicago. The clause requiring leaders to sign affidavits declaring they are not Communists, before their unions can use facilities of the NLRB was stirring up trouble particularly in the wire and wire products field.

★ ★ ★

AT this point President Truman came out fighting on the Taft-Hartley issue. He pointed out his vehement veto message and declared himself the foe of Taft-Hartleyism. Dewey placed the GOP stamp of approval on the law.

★ ★ ★

PRESIDENTS William Green of the AFL and Phil Murray of the CIO were quick to point this out and draw up recommendations for immediate legislative action in the 81st Congress looking toward repeal.

★ ★ ★

THERE is considerable evidence leading an impartial observer to agree with the labor leaders that the Taft-Hartley law was one of the most important issues in the campaign.

★ ★ ★

DECISIONS by the National Labor Relations Board in the few weeks preceding the voting had aroused union men the country over. Many who had paid little attention to the Act when it was passed by Congress over a Presidential veto were getting worked up over the situation.

★ ★ ★

THE Board had ruled that strikers who were out on an economic issue could not vote as employees in a plant election. The same decision gave strike breakers and those who had remained on the job the right to full participation in such an election.

★ ★ ★

ANOTHER decision which caused union men to rise up

in wrath, was the board's ban on mass picketing. The NLRB held that mass picketing, even when peaceful, is coercion and therefore is barred by the Taft-Hartley law.

★ ★ ★

SO convincing was Truman's campaigning on the issue that millions of labor union members forgot that Truman had threatened the drafting of strikers during the railroad strike and that the Administration had imposed heavy fines on John L. Lewis and the United Mine Workers during the coal strike.

★ ★ ★

CIO'S political action committee and the newly formed AFL political organization definitely chose Truman as the "lesser of two evils." The small size of the vote for Henry A. Wallace bears out this conclusion beyond reasonable doubt.

★ ★ ★

NOW it's up to President Truman to make good on his campaign promises. Experienced observers here do not expect the Administration to remove all the restraints included in the Taft-Hartley law.

★ ★ ★

THE Democratic platform itself pledged the party to enact some kind of legislation regulating labor-management relations. President Truman has made it clear that he will oppose dropping of the non-Communist requirements affecting labor leaders.

★ ★ ★

HOWEVER, it can be safely assumed at this point that the laws relating to plant elections, the ban on the closed shop and the ban on mass picketing will go by the boards if the administration and its majority in Congress pull together.

★ ★ ★

OF course there are elements in the Democratic party which will oppose easing of the law. It is doubtful though that even combining with the Republican minority in Congress they can prevent repeal of Taft-Hartleyism.

★ ★ ★

WE BUY WE SELL

We Pay Highest Prices for Used Machinery

FOR SALE

WARDWELL BRAIDERS
TRIPLE-DECK BRAIDERS
TAKE-UP STANDS
DUAL HEAD COILING MACHINES
WIRE DRAWING MACHINES
JUTE and FILL MACHINES

All Machines Reconditioned in Our Own Shop

WIRE & TEXTILE MACHINERY INC.
P. O. BOX 436, PAWTUCKET, R. I.

USE THE PROVEN BRAND . . .

Whatever wire product you make, Cortland Brand wire can help you make it better. For wire fabrication of all types, Cortland wire has the right softness or hardness, freedom from surface defects, and correct lubricating properties. There is a Cortland wire in a size and style to fit your requirements.

Cortland BRAND
WICKWIRE BROTHERS, INC., CORTLAND, N. Y.

Free!

Get the FACTS:

Unexcelled in the field of spiral wrapping, Angier offers a service that is complete.

1. Floor and Bench Model Machines.
2. Creped-to-stretch spiral wraps: single ply, duplex asphalt waterproofed, resinous laminated.
3. Installation and trouble-free service at no cost.

Get the facts in our free booklet "The Better Way to Wrap Coils" . . . or invite your Angier Engineer to call.

SINCE 1895
Angier
CORPORATION
FRAMINGHAM 3 • MASSACHUSETTS

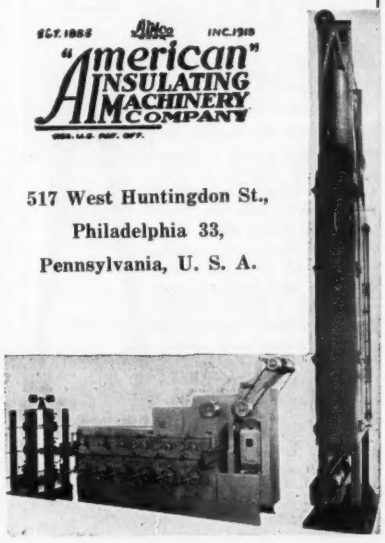
H-12 WIRE ENAMELING MACHINE NO. 885

Electric Heated Oven (Single Sided) Take-up is Horizontal With Dual Spindles For Large or Small Reels.

One of Our Full Line of Wire Enameling Machines

"American" INSULATING MACHINERY COMPANY

517 West Huntingdon St.,
Philadelphia 33,
Pennsylvania, U. S. A.



NEW Inhibitor Gives Better Pickling Results

Try Oakite Pickle Control No. 3 for inhibiting sulphuric-acid pickling. Reduces attack on steel without retarding action on rust or scale. Prevents waste of acid after rust and scale have been removed. Saves some customers up to 19 cents a ton.

FREE—Phone the Oakite Technical Service Representative in your city for free demonstration of Oakite Pickle Control No. 3. Or write today for free copy of Special Report F-488OR2 on "Improved Pickling With Oakite Materials."

OAKITE PRODUCTS, INC.
52A Thames Street, NEW YORK 6, N. Y.
Technical Representatives in Principal Cities of U. S. & Canada

OAKITE
REG. U.S. PAT. OFF.

Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

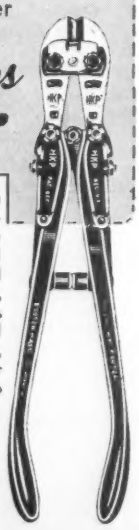
the POWER *line*

There is a PORTER CUTTER for EVERY CUTTING NEED

PORTER *Cutters*

Multiply Hand Power

80 Times



Pressure of 50 pounds on the handles exerts a pressure of 2 TONS at the cutting edge. Tempered spring wire, chrome ball wire, cold-drawn alloy wire, stranded guy wire, cables — wire of all kinds hard or soft, insulated or not, — there's a Porter Cutter that does each cutting job quicker, easier and safer.

SEND FOR FOLDER showing the newly designed *improved* Porter Cutters.

H. K. PORTER, INC.
74 Foley St. Somerville, Mass.

Evaluation of Pickling Inhibitors From the Standpoint of Hydrogen Embrittlement. III. Conditions of Cathodic Pickling

(*Continued from page* 1130)

this inhibitor which promotes embrittlement, and which accumulates to an important extent with large additions of the reagent.

* * *

RECALLING the results from the previous papers [1, 2] one thus finds Reagent IX in the position of greatest preference among all studied standard reagents for acid pickling or cathodic pickling, stainless steel and mild steel alike.

* * *

AS for the special inhibitor, Reagent XV, cathodic pickling places it ahead of all reagents here as in the other tests. In fact, complete inhibition of measurable embrittlement in mild steel occurs at concentrations so far below the proprietary range that Figure 14 carries an inset showing the detail of the early portions of the inhibition curve.

* * *

ON the other hand, the inhibition of embrittlement achieved by Reagent XV in the acid pickling of stainless steel does not reproduce itself in the cathodic tests with stainless steel, the blank value remaining essentially unaltered. The same is true for Reagent XVI, whose data are not reproduced.

* * *

Conclusion

IN summarizing the principal disclosures of this study on the effect of commercial inhibitors on hydrogen embrittlement incurred during cathodic pickling, we find that:

1) Of fifteen reagents tested, eleven markedly increase the embrittlement of mild steel and stainless steel alike;
2) One of the reagents increases the embrittlement of mild steel, but has no effect on stainless steel;
3) The remaining three prevent embrittlement of mild steel safely below the minimum of their proprietary ranges, but have no effect whatsoever upon stainless steel;
4) No reagent inhibits the embrittlement of stainless steel, but instead either increases it or leaves the blank value unaltered; whereas the effects of the same reagents on mild steel vary from marked embrittlement to extremely effective recovery;

BORAX
for
Wire Drawing

After pickling, BORAX can be applied with one dip; dries in three minutes in an oven temperature of 150° F. to provide a coating that will not check or flake off in storage. Dissolves readily in water and is dust free. BORAX, other than being an excellent vehicle for picking up the drawing lubricant, is rust inhibiting and a natural flux that will facilitate the making of good butt welds. Use BORAX to make better wire at less cost. Used in many mills.

Send for complete particulars

PACIFIC COAST BORAX CO.
51 Madison Ave., New York 10, N. Y.

EASTWOOD WIRE
CENTRIFUGALLY-CAST FOR QUALITY

Phosphor Bronze — WIRE, FLAT
Nickel Silver — WIRE, ROD

Eastwood-Nealley
CORPORATION
Belleville 9, New Jersey

SPOOLS...
REELS...
BOBBINS
● IF IT CAN be wound on a reel, spool or bobbin, Apco Mossberg can fill your needs.
For over 50 years we have specialized in the manufacture of spools and reels of all kinds. Our plant is equipped to manufacture almost any conceivable kind, type and size of steel spool, reel and bobbin, in large quantities or small.
Write for our brochure containing useful information on a wide variety of our spool and reel products.
APCO MOSSBERG CO.
Attleboro, Mass., U.S.A.
Hugh Williams & Co., 47 Colborne St. Toronto, Ontario, Canada
Pacific Coast Representative, Jack P. Williams, Jr., Matson Building, 215 Market St., San Francisco 5, Calif.

VIANNEY

Famous Wire Drawing Diamond Dies

All sizes from .080 down to .00039 in stock from New York.

Appropriate profiles available for soft, medium and hard metals or to your specifications.

VIANNEY WIRE DIE WORKS
250 E. 43rd St., New York
V. J. Boulin, Manager

5) All reagents, which in the previous research on acid pickling of mild steel failed to repress embrittlement regardless of their concentrations, uniformly increase embrittlement under conditions of cathodic pickling;
6) Also, all reagents which increased embrittlement in the acid pickling of stainless steel cause increased embrittlement under conditions of cathodic pickling;
7) All reagents which in the previous research on acid pickling of stainless steel either decreased embrittlement or left the condition unaltered similarly leave the blank value unaltered under conditions of cathodic pickling.

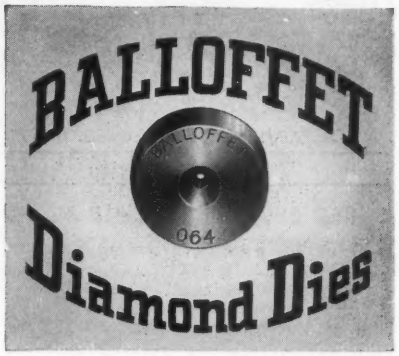
★ ★ ★

As for the individual inhibitors:

1) Reagent XV—a new and specially designed product—again discloses the most preferred behavior, consistent with the tests on acid pickling of both stainless steel and mild steel;
2) Reagent IX, the most preferred standard product on the basis of previous tests with acid pickling, again attains a preferred classification by effectively inhibiting the embrittlement of mild steel at concentrations less than proprietary;
3) Reagent III is comparable to Reagent IX, losing in comparison particularly on the basis of the previous tests with acid pickling of stainless steel;
4) Reagent XIII, highly effective in the acid pickling of mild steel, but unacceptable for the acid pickling of stainless steel, reacts poorly under conditions of cathodic pickling for both steels;
5) Reagent IV, as in the preceding researches on acid pickling, seems to indicate better activity with stainless steel than with mild steel on the basis of its comparative position among the reagents;
6) Reagents II, VII, XII, and XIV, which attained prevention, but scarcely, of embrittlement in mild steel at concentrations just within or beyond their proprietary additions, all increase embrittlement of mild steel and stainless steel alike under conditions of cathodic pickling.
7) Reagents I, IV, V, VI, VIII, X, and XI, which failed to prevent embrittlement of mild steel during acid pickling, increase the embrittlement of both mild steel and stainless steel under conditions of cathodic pickling.

★ ★ ★

On the basis of the three studies there now results a fairly comprehensive picture of the present situation regarding the practical relationships of commercial pickling inhibitors to problems of hydrogen absorption — which extend beyond the present considerations of embrittlement of wire to general embrittlement and cracking of hardened steel parts, blistering in sheet and strip, and defects



Skill and accuracy in manufacture with the use of selected stones make Balloffet Diamond Dies the choice of the most critical users.

IDIA MEMBER INDUSTRIAL DIAMOND ASSOCIATION OF AMERICA, INC.

Large stock on hand of domestic and imported dies available for immediate shipment in sizes from .0004" to .081"

BALLOFFET
DIES AND NOZZLE CO., Inc.
6825 Adams St., Guttenberg, N. J.
Quality Diamond Dies Since 1870

WIRE DRAWING DIES

Diamond and Carbide

Use Wayne Dies for best results.
Complete stocks of dies plus die engineering service assure you of proper dies for any wire drawing condition.
Consult us on your die problems.
Wayne Dies have been called:
"THE BEST DIES OBTAINABLE"
Also, Die Making Machinery.

WAYNE WIRE DIE CO.
200 Pennsylvania Avenue,
Hillside 5, N. J.
Tel.: ELizabeth 2-2456

DIAMOND DIES .0006 - .120 DIAMOND POWDER
INDUSTRIAL AJAX SUPPLIES INC.
R.R. 4, P.O. Box 66, Fort Wayne, Ind.

NEW ENGLAND WIRE DIE CO.
7 Forsberg St., Worcester, Mass.
EXPERT RECUTTING
DIAMOND DIES, DIAMOND POWDERS
Eastern Representative of
Ajax Industrial Supplies, Inc.

DIAMONDS for WIRE DRAWING DIES and CUTTING TOOLS
DIAMOND POWDER UNIFORM QUALITY
CHAMPION DIAMOND COMPANY, INC. 551 Fifth Ave., New York 17

CONSULTANT AND SPECIALIST
DRAWING LUBRICANTS
Hans C. Bick, Inc.
READING, PA.

Wire Drawing Diamond Dies

COCHAUD
WIRE DIE CORPORATION
300 W. 56th St., NEW YORK
Tel. COlumbus 5-1340

in applied coatings related to subsequent issuance of the gas from the basis metal. Two new preliminary products have also been disclosed which point the way toward correcting the problem. Their more complete description, along with that of further improved reagents, will be resumed in a later publication devoted to discussion of means for correcting the imperfections herewith disclosed.

★ ★ ★

AS for its fundamental aspects, this work proves the activity of powerful chemical principles, as yet unidentified, which concern the constitution of inhibitors, their polar or ionic structure and mode of attachment to the surface of the metal, and the subtle effects by which important quantities of hydrogen gas are absorbed by the metal quite irrespective of the total quantity of gas developed. There is also direct proof of a strong effect of the alloy content of the steel, particularly where chromium is concerned. Although no answers to these fundamental questions are forthcoming as yet, the direction in which the answers lie is strongly indicated by the

DIAMOND DIES
.000's to .102
Fort Wayne Wire Die Inc.
2625 E. Pontiac St. Fort Wayne, Ind.

L & H DIE COMPANY
Specialists in all types of
TUNGSTEN CARBIDE DIES
Namely Rounds, Squares, Flats, Hexagons, Extruding and Special Shapes.
Also Mandrels in all sizes.
RFD #4, Box 504-B, Royal Oak, Mich.
Telephone: Lincoln 1-8788

THERMOPLASTIC CABLE SHEATHING KRAFT
for your non-metallic sheathed products.
Strong . . . .
Time-tested . . . .
Water-repellent . . . .
No wax saturation needed.
MERRIMAC PAPER COMPANY, INC.
295 Madison Ave., New York, N. Y.
MURRAY HILL 3-0585

DIAMOND WIRE DRAWING DIES
INDIANA WIRE DIE COMPANY
314-324 E. Wallace St.,
Fort Wayne, Indiana

DIAMOND AND CARBIDE WIRE DRAWING DIES
RUSCH WIRE DIE CORPORATION
Croton-on-Hudson, N. Y.

Finishing and Recutting Diamond and Carbide
Wire Drawing Dies our specialty
HOOSIER CARBIDE DIE, INC.
P. O. Box 423, FT. WAYNE, IND.

WIRE DRAWING, EXTRUSION, HEADING and SHAPED DIES
Mandrels and Wear Resisting Tungsten Carbide Parts.
EASTERN TUNGSTEN CARBIDE CO.
40 E. Bigelow St., Newark 5, N. J.

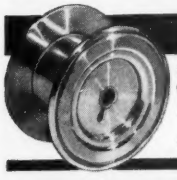
DIAMOND CARBIDE
DIES
KELLY
WIRE DIE CORPORATION
19 W. 34th St. New York

TESTING MACHINES
for WIRE, RUBBER, PAPER, TEXTILES, etc.
SCOTT TESTERS, INC.
55 Blackstone St. • Providence, R. I.
"Standard of the World"

WOOD REELS and SPOOLS
AMERICAN WOODWORKING COMPANY
1" to 60" Diameters
OVER 50 YEARS EXPERIENCE
1674 No. Lowell Avenue
Chicago, Ill.

SLEEPER & HARTLEY, Inc.
Designers and Builders
SPRING COILERS
WIRE WORKING MACHINERY
WIRE MILL EQUIPMENT
SPECIAL MACHINERY
Address Inquiries to
Box 1249
WORCESTER, MASS.

FURNACE ENGINEERS INC.
FURNACES
FOR THE
WIRE INDUSTRY
F.E.I.
1551 W. Liberty Ave.
Pittsburgh, Pa.



ACROPAK
Drawn Aluminum Alloy Spools for Precision Wire Packaging
ACROMETAL PRODUCTS, INC.
604 Fifth Street North
MINNEAPOLIS 1, MINNESOTA

CLEVELAND TRAMRAIL
Division of
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE, OHIO
Leading manufacturers of
OVERHEAD MATERIALS HANDLING EQUIPMENT
for the Wire and Wire Products Industry

WATER PROOF and CREPE PAPER
in rolls of any size for wrapping coils and reels.
CREPE-KRAFT BARREL LINERS
THE CREPE-KRAFT COMPANY
Division of National Waterproof Papers Inc.
Camden, N. J.

METAL PICKLING EQUIPMENT
(Acid-Resisting)
Hairpin Type
Wire Pickling Yokes
CLARK E. GORDON, INC.
8-165 General Motors Building,
Detroit 2, Michigan

NILSON AUTOMATIC PRESS and FOUR SLIDE MACHINES
For Swaging, Stamping, Piercing, Blanking & Forming Coiled Metal.
THE A. H. NILSON MACHINE CO.
BRIDGEPORT, CONN., U.S.A.

EISLER **TRANSFORMERS**
* STANDARD and SPECIAL *
AIR — OIL or WATER-COOLED
Sizes from ¼ to 400 KVA

* FINE WIRE BUTT WELDERS *
* SPOT WELDERS *
EISLER ENGINEERING CO., INC.
747 South 13th St. Newark 3, N. J.

cross-referencing available among the numerous data given.

Acknowledgment

ACKNOWLEDGMENT is made to the Office of Naval Research for its support of the fundamental research program on gas-metal studies from which the present paper stems as a special study; and to F. P. Spruance, A. Douty, A. J. Saukaitis and E. A. Stockbower of the American Chemical Paint Company for their splendid cooperation in carrying this work forward to useful application in the industrial pickling of steels.

Bibliography

1. EVALUATION OF PICKLING INHIBITORS FROM THE STANDPOINT OF HYDROGEN EMBRITTLEMENT.
I. ACID PICKLING OF STAINLESS STEEL.
C. A. Zapffe and M. E. Haslem.
Wire & Wire Products, Vol. 23, No. 10, p. 933 (1948).
2. EVALUATION OF PICKLING INHIBITORS FROM THE STANDPOINT OF HYDROGEN EMBRITTLEMENT.
II. ACID PICKLING OF CARBON STEEL.
C. A. Zapffe and M. E. Haslem.
Wire & Wire Products, Vol 23, No. 11, p. 1048 (1948).
3. EFFECT OF COMPOSITION, HEAT-TREATMENT, AND COLD-WORK ON THE HYDROGEN EMBRITTLEMENT OF STAINLESS STEEL WIRE DURING CATHODIC PICKLING.
C. A. Zapffe and O. George Specht.
Trans. Am. Soc. Metals 39, 193-211; disc., 212 (1947).
4. ACID COMPOSITION, CONCENTRATION, TEMPERATURE, AND PICKLING TIME AS FACTORS IN THE HYDROGEN EMBRITTLEMENT OF MILD STEEL AND STAINLESS STEEL WIRE.
C. A. Zapffe and M. Eleanor Haslem.
Trans. Am. Soc. Metals 39, 213-37; disc., 237-40 (1947).

FOR YOUR SPOOLS AND REELS
Patented all-steel electro-welded Drawing and Annealing and patented metal-bound shipping spools and reels.
Hubbard Spool Company
1624 Carroll Avenue, Chicago, Illinois

WIRE SPOOLING
STRAIGHTENING and CUTTING
PAPER and COTTON SERVING
BRASS, BRONZE, COPPER & STEEL
WIRE IN STOCK
PARAMOUNT WIRE COMPANY
100 Bleecker Street
New York 12, N. Y.

SPECIALISTS IN
DRAWING COMPOUNDS
and
SOAP POWDERS
for
WIRE DRAWING
Established in 1906
NEIL C. POTTER
24 COMMERCE ST.
NEWARK 2, N. J.

SC Designers and Builders of Gas-Fired Heat Treating Furnaces for Ferrous and Non-Ferrous Wire.
SURFACE COMBUSTION CORP.
Main Plant & General Offices:
Toledo, Ohio

DI-ACRO Bender No. 1

forms round, flat or square wire to accurately duplicated shapes.
Send for Catalog
O'Neil-Irwin Mfg. Co.
303 — 8th Ave.
Lake City, Minnesota

RUESCH
Machinery For
Wire, Tube, and Brass Mills
409 Mulberry Street, Newark, N. J.

ROSS WIRE • ROD **OVENS**
J. O. Ross Engineering Corp.
350 Madison Avenue, New York 17, N. Y.
CHICAGO - BOSTON
DETROIT - LOS ANGELES

CHEMICAL-PROOF CONSTRUCTION
LININGS TANKS HEATING UNITS
Crates, Yokes, Baskets
Rubber Koroseal Plastics Brick
Monel Stainless Lead
Impervious Graphite
HEIL PROCESS EQUIPMENT CORP.
12905 Elmwood Ave. Cleveland, Ohio

MUSIC WIRE
For Mechanical Purposes
Plain Polished, Tinned, Straightened and Cut Lengths
Fine Sizes — Special Wires — Strands and Cables — Spooled and Coiled Wires

Aluminum	Pure Iron
Annealed	Pure Nickel
Brass	Resistance
Copper	Stove Pipe Wire
Florists	Stainless
Monel	Straightened and Cut
Music Wire	Tag Wire
Nickel Silver	Trolling Wire
Oil Tempered	Leader Wire
Phosphor Bronze	
Picture Wire	

THE MALIN & CO.
2514 Vestry Ave., Cleveland 13, Ohio

LANCASTER, ALLWINE & ROMMEL
REGISTERED PATENT ATTORNEYS
Suite 438, 815—15th St., N. W.
Washington 5, D. C.

●

Practice
before U. S. Patent Office. Validity and Infringement Investigations and Opinions.
Booklet and form "Evidence of Conception" forwarded upon request.

KENNETH B. LEWIS
CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
43 Midland St., Worcester, Mass.
Phone: Worcester 5-6033

Consultants on
SPRING DESIGN
Materials & Applications
Methods & Manufacturing
THE CARLSON COMPANY
277 Broadway New York 7, N. Y.
BArclay 7-2552

WALLACE G. IMHOFF
Consultant in Zinc Coating
(Hot Galvanizing)
905 South Bedford St.
Los Angeles 35, California
Tel. CRestview 5-2732

Specify **SAUEREISEN**
ACIDPROOF CEMENTS—COMPOUNDS
FOR
Tanks, Sewers, Stacks, Floors
Technical cements for all purposes.
Send sketches or samples
Sauereisen Cements Company · Pittsburgh 15, Penna

NEP · SUMFOAM
ACID INHIBITOR • PICKLING COMPOUND
THE WM. M. PARKIN CO.
HIGHLAND BLDG. PITTSBURGH 6, PA.

THE MONTGOMERY COMPANY
Established 1871
25 CANAL STREET
WINDSOR LOCKS, CONN.

BARE ELECTRIC TINSEL CONDUCTOR and RESISTANCE TINSEL CORDAGE • TINSEL LAME • DECORATIVE TINSEL THREADS, CORDS, LAMINETTES

The Handling of Webs and Monofilament Materials

(*Continued from page* 1133)

the bottom idler sheaves. The sheaves nearest the floor have been provided as individual capstan sheaves to assist the strand through the coating pots. In this case, there are 17 complete passes. The assisting capstan sheaves are synchronously driven with proper considerations to diameter buildup as the material is coated. As the cord diameter increases, the effective speeds of these sheaves must be reduced. A completely synchronized drive allows for that speed decrease. The illustration shows the arrangement of equipment at the bottom of the tower.

★ ★ ★

FIGURE NO. 14 depicts the actual conditions of the sheave placement at the top of the drying tower, 50′-0″ over the coating pots. These sheaves are the cross-over sheaves which help to effect the cross-over from pass to pass.

★ ★ ★

EVEN in consideration of the many types of systems and processes as shown herein, only the more well-known operations have been described. In reviewing the field of handling equipment for webs and monofilaments there are many other items which could have been included, but which, in consideration of the total length of this paper, have been omitted. In this category of equipment types are the air tension clutch, high slip motors, surface winders and equipment of that general type. Although these units are quite often used in winding applications, normally they can not be employed to replace a complete system drive. As the consideration was empirical they were not included.

ZINC WIRE
THE PLATT BROS. & CO.
Waterbury, CONN.

Annealing Pots and Boxes
Galvanizing Kettles
Lead and Spelter Pans
Pressure Vessels
National Annealing Box Co.
Established 1895
Washington, Penna.

WIRE WORKING MACHINERY
"Offered for Prompt Shipment"
WATERBURY-FARREL Continuous Wire Drawing Machines No. O Sleeve Type, Motor Driven with A. C. Motors, ¼" Cap. and Down.
WATERBURY & MANVILLE Cold Headers and Thread Rollers.
NILSON & BAIRD Nos. 1, 2, & 324 Four-slides.
U. S. TOOL No. 33 MULTI-SLIDES.
SLEEPER & HARTLEY and TORRINGTON Coilers.
LEWIS & SHUSTER Round and Shaped Wire Automatic Straightening and Cutting Machines.
LEWIS No. 3-F & No. 4-F Flying Shear Wire Straightening & Cutting Machines.
NATIONAL MACHINERY EXCHANGE
128-138 MOTT ST. NEW YORK, N. Y.

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames — 16″ Frames, 8″ Frames — Take-Up Frame, Wire — Pointers — Puller Tongs. — General and heat resisting alloy castings for wire mill use.
Circulars on Request.
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

FOR SALE
Waterbury-Farrel Continuous Wire Drawing Machine No. 2, 14 Die Cone Type. 50 H.P. Motor driven with 1000 lb belt type spooler. Copper machine with finishing speed of 4500 feet per minute for size 18 to 22 B&S Gauge.
Reply Box No. 509
WIRE & WIRE PRODUCTS

FOR SALE
One Used Tinius Olsen Tensile Testing Machine in good condition, 10,000 lb. capacity, Universal Type, Vernier Beam, arranged for direct drive, motor mounted on bracket.
Eaton Manufacturing Company
P. O. Box 389, Massillon, Ohio

STAINLESS STEEL WIRE
Available for
IMMEDIATE DELIVERY
At Reduced Prices
200,000 lb .187″ Dia.
80,000 lb .156″ Dia.
Type 430 Allegheny 17
Coils In Original Wrapping
Write Room 525 Bldg. 21
Call Corning 372 Ext. 271
CORNING GLASS WORKS
Corning, N. Y.

Index to Advertisers

A

Acrometal Products, Inc. 1175
Ajax Electric Company, Inc., ... 1154
Ajax Industrial Supplies, Inc. 1174
Aluminum Company of America 1107
American Chemical Paint Co. 1153
American Insulating Machinery Company 1171
American Woodworking Company 1174
Angier Corporation, The 1171
Apco Mossberg Company 1173
Armco Steel Corporation 1108

B

Balloffet Dies & Nozzle Co., Inc. 1173
Bethlehem Steel Co. 1090
Bick, Hans C., Inc. 1174
Black Industries, Inc. 1099
Boyd, Chas. P. Corp. 1170
Bridge Mfg. Co., Inc., ... 1164

C

Carboloy Company. Inc. 1089
Carl-Mayer Corp., The 1164
Carlson Company 1176
Champion Diamond Co. 1174
Chase Brass & Copper 1093
Clark, J. L., Manufacturing Co. 1155
Cleveland Tramrail Division of the
Cleveland Crane & Engineering Co. 1175
Cochaud Wire Die Corporation 1174
Continental Steel Corp. 1098
Crepe-Kraft Co., The
Division of National Waterproof Papers, Inc. .. 1175

D

Durant Mfg. Co. 1168
Durkee Mfg. Co. 1170

E

Eastern Carbide Corp. 1160
Eastern Tungsten Carbide Co. 1174
Eastwood-Nealley Corp. 1172
Eisler Engineering Co. 1175
Electric Furnace Company ..... Back Cover
Emory, Robert J. Company 1163
Engis Equipment Co. 1158
Entwistle, James L. Co. 1092

F

Firth-Sterling Steel & Carbide Corp. 1116
Fort Wayne Wire Die, Inc. 1174
Furnace Engineers, Inc. 1175

G

Glader, Wm., Machine Works 1147
Gordon, Clark E., Inc., ... 1175

H

Haveg Corporation 1168
Hayes, C. J., Inc. 1161
Heil Process Equipment Corp. 1175
Hoosier Carbide Die, Inc. 1174
Howsam Spool Co. 1170
Hubbard Spool Company 1175
Hudson Wire Co. 1096
Hughesville Machine & Tool Co. 1148

I

Imhoff, Wallace G. 1176
Indiana Wire Die Company 1174
Industrial Ovens, Inc. 1097
International Nickel Corp., The 1100

J

Johnson Steel & Wire Co., Inc. 1163

K

Kelly Wire Die Corp. 1174
Keystone Steel & Wire Co. 1145

L

L. and H. Die Co. 1174
Lancaster, Allwine & Rommel 1176
Lewis, K. B. 1176
Lewis, Machine Co., The 1170

M

Magnus Chemical Co. 1101
Malin & Company, The 1175
Martin, Glenn L., Company 1091
Merrimac Paper Co., Inc., ... 1174
Metal & Thermit Corp. 1169
Metal Carbides Corporation 1105
Micro Products Company 1144
Miller, R. H. Company, Inc. 1152
Modern Plastic Machinery Corp. 1165
Montgomery Company, The 1176
Morgan Construction Company ..... Front Cover
Mossberg Pressed Steel Corp. 1149

N

National Annealing Box Co. 1176
National Machinery Exchange 1176
New England Butt Company 1106
New England Wire Die Co. 1174
Niles Steel Products Div., Republic Steel Corp. 1115
Nilson, A. H., Machine Co., The 1175
North American Philips Company, Inc. 1156
Norton Company, The ..... 1102 & 1165
Nopco Chemical Company 1157

O

Oakite Products, Inc. 1172
O'Neil-Irwin Mfg. Co. 1175
Owens-Corning Fiberglas Corp. 1094

P

Pacific Coast Borax Co. 1172
Parkin, Wm. M. Co., The 1176
Paramount Wire Company 1175
Pittsburgh Cut Wire Co. 1150
Platt Brothers & Co., The 1176
Porter, H. K., Inc. 1172
Potter, Neil C. 1175

R

Red Star Engineering Corp. 1169
Robertson, John Co., Inc. 1104
Rockwell, W. S., Company 1166
Roebling's, John A., Sons Company 1095
Roos, Tool & Mfg. Co. 1146
Ross, J. O., Engineering Corp. 1175
Royle, John & Sons 1151
Ruesch, H. J. Machine Co. 1175
Rusch Wire Die Corporation 1174

S

Sauereisen Cement Co. 1176
Scott Testers, Inc. 1174
Scudder, E. J. Foundry & Machine Co. 1176
Sjorgen Tool and Machine Co., Inc. 1167
Sleeper & Hartley, Inc. 1174
Standard Industrial Compounds 1109
Surface Combustion Corp. 1175
Syncro Machine Company 1110

T

Trauwood Engineering Co. 1166
Twitchell, E. W., Inc. 1167

V

Vascoloy-Ramet Corp. 1112
Vaughn Machinery Co. 1103
Vianney Wire Die Works 1173

W

Warner Company, The 1169
Waterbury Farrel Foundry & Machine Co. 1114
Watson Machine Company ..... Inside Back Cover
Wayne Wire Die Co. 1173
Wean Equipment Corp. 1159
Wickwire Brothers, Inc. 1171
Willey's Carbide Tool Co. 1162
Wilson, Lee, Engineering Co., Inc. ... Inside Front Cover
Wire & Textile Machinery, Inc. 1171

Y

Youngstown Sheet & Tube Company 1111

WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyer's Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ACID INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

ACID-PROOF CONSTRUCTION
Haveg Corporation, Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy., Inc., Pawtucket, R. I.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ross, J. O., Engr. Corp., New York, N. Y.

BAR STOCK—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Company, Cleveland Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
U. S. Steel Export Company, New York, N. Y.

BENDERS—
O'Neil Irwin Mfg. Co., Minneapolis, Minn.

BOBBINS—Braider & Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

BORAX—Wire Drawing
Pacific Coast Borax Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Pawtucket, R. I.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

CABLE LACQUERING OVENS—
Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N.J.

CEMENTS—Acid Proof
Sauereisen Cements Co., Pittsburgh, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.
Sauereisen Cements Co., Pittsburgh, Pa.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Metal and Hand
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Metal & Thermit Corp., New York, N. Y.
Nopco Chemical Co., Harrison, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Metal & Thermit Corp., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH TESTERS—
Scott Testers, Inc., Providence, R. I.

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Spencer Steel Division, Colorado Fuel & Iron Corp., Buffalo, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J. Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

COLD HEADERS—
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Diamond
Magnus Chemical Co., Garwood, N. J.
Engis Equipment Co., Chicago, Ill.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Nopco Chemical Co., Harrison, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.
Swift & Company, Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Champion Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Champion Diamond Co., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND TOOLS—
Carboloy Co., Inc., Detroit, Mich.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Cold Heading
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Lead Extrusion
Carboloy Co., Inc., Detroit, Mich.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.

WHERE TO BUY, Continued

Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Sintered Carbide
Hoosier Carbide Die Co., Ft. Wayne, Ind.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tubing
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Modern Plastic Machinery Corp., Lodi, N. J.
Rockwell, W. S. Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N. Y.

ENGINEERS—Consulting Spring Design
Carlson, Co., The, New York, N.Y.

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Hayes, C. I., Providence, R. I.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Rockwell, W. S., Co., Fairfield, Conn.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Hayes, C. I., Providence, R. I.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Rockwell, W. S., Co., Fairfield, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co. Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

HOOKS—Pickling and Liming
Gordon, Clark E., Detroit, Mich.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Martin, Glenn L., Company, Baltimore, Md.
Owens Corning Fiberglas Corp., Toledo, O.
Standard Varnish Wks., Staten Island, N. Y.
Twitchell, E. W., Philadelphia, Pa.
Warren Thread Works, Inc., W., New York, N. Y.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co. Waterbury, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co. Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co. Chicago, Ill.
Swift & Company, Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Rockwell, W. S., Co., Fairfield, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

WHERE TO BUY, Continued

MACHINERY—Coilers
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Copper Wire Drawing and Rolling
Aetna Standard Eng'g Co., The, Youngstown, O.
American Insulating Mach'y Co., Phila., Pa.
National Machinery Exchange (used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch. (Used) New York, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Red Star Engineering, Inc., Rahway, N. J.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Aetna Standard Eng'g Co., The, Youngstown, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Modern Plastic Machinery Co., Lodi, N. J.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Modern Plastic Machinery Co., Lodi, N. J.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R.I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Black Industries, Cleveland, Ohio
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Pickling
Gordon, Clark E., Detroit, Mich.

MACHINERY—Pointing
Aetna Standard Eng'g Co., The, Youngstown, O.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
Royle, John & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila, Pa.
Black Industries, Cleveland, Ohio.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Red Star Engineering, Inc., Rahway, N. J.
Ruesch, H. J. Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd, Charles P. Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
National Mach'y Exch. (Used), New York, N.Y.
Modern Plastic Machinery Co., Lodi, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch, H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Physical
American Optical Co., Buffalo, N. Y.
Scott Testers, Inc., Providence, R. I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna Standard Eng'g Co., The, Youngstown, O.
Industrial Ovens, Inc., Cleveland, Ohio.
Modern Plastic Machinery Co., Lodi, N. J.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
Aetna Standard Eng'g Co., The, Youngstown, O.
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N.Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N.Y.

MACHINERY—Wrapping Wire Coils
Angier Corporation, Framingham, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MATERIAL—Resistance Heating Strand
Trauwood Engineering Co., Cleveland, Ohio.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
U. S. Steel Export Co., New York, N. Y.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Chase Brass & Copper, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.

OPTICAL EQUIPMENT—Metallurgical
American Optical Co., Buffalo, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corp., The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corp., The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING—Hooks, etc. Acid Resisting
Gordon, Clark E., Detroit, Mich.

PICKLING TANK LININGS—
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS
Entwistle, James L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STANDS—
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS & SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing, Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N.Y.

RODS—Nickel Alloy
Eastwood Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

RODS—Stainless Steel
Armco Steel Corp., The Middletown, Ohio.

RODS—Wire—Non-Ferrous
Eastwood Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel, Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

WHERE TO BUY, Continued

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc., Pawtucket, R. I.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Potter, Neil C., Newark, N. J.
Swift & Company, Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Chase Brass & Copper, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.
Rockwell, W. S., Co., Fairfield, Conn.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Rockwell, W. S., Co., Fairfield, Conn.
National Annealing Box Co., Washington, Pa.

TINSEL—Cords, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Electric Conductor
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Electric Resistance
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Lame, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Thread, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Thread, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ruesch, H. J., Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—For Insulation
General Electric Co., Schenectady, N. Y.
Standard Varnish Wks., Staten Island, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago Ill.
Sciaky Bros., Inc., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Chase Brass & Copper, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Co., Inc., New York, New York
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago & New York
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper, Waterbury, Conn.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div. of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland-Chicago, New York
Columbia Steel Co., San Francisco, Calif.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
Paramount Wire Co., New York, N. Y.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE—Nickel & Nickel Alloy
Eastwood-Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

WIRE—Nickel Silver and Phosphor Bronze
Chase Brass & Copper, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Chase Brass & Copper, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., New York, New York.
Paramount Wire Co., New York, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRESERVING—Paper and Cotton
Paramount Wire Co., New York, N. Y.

WIRE—Spring
American Steel & Wire Co., Cleveland-Chicago
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U.S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Paramount Wire Co., New York, N. Y.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting—
Paramount Wire Co., Inc., New York, N. Y.
Pittsburgh Cut Wire Co., Pittsburgh, Pa.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Chase Brass & Copper, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Paramount Wire Co., New York, N. Y.

WRAPPING PAPER—Creped
Angier Corporation, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Delaware
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.
Warren, W., Thread Works, Inc., New York, N.Y.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

INDEX

Covering the Principal Subjects and Articles Which Appeared in Volume 23 of WIRE AND WIRE PRODUCTS from January to December 1948, Inclusive

—A—

Above the Ears of Men—A Philosophy of the Future by Kenneth Smith 769
Acid Pickling—Results with Sulfuric Acid 569
Administration of Inspection and Despatch in a Steel Wire Mill by C. Coates 307
Aluminum Coating of Steel Products by A. diGiulio 670
Aluminum Fumes 315
Annealing Copper Wire 591
Automatic Equipment for Deburring Bolts and Nuts by N. Ransohoff 773
Automobile—Wire in 29

—B—

Bolts and Nuts—Deburring 773
Brake Casing and Strand Wire 33
Brass Wire Processing by C. Witteveld 876
British Situation—The 420

—C—

Cadmium Fumes 318
Cadmium Plating Process 84
Cathodic Pickling of Austenitic Stainless Steel (Chromium Nickel) 565
Cleaning Non-Ferrous Metals with Sodium Hydride by H. L. Alexander 35
Clutch-Friction Slip 765
Coating of Steel-Aluminum 670
Coating of Wire-Metallic 135
Coating Progress—Okoloy 47
Coatings—Wire 762
Coil Spring Manufacture 588
Coldworking and Hydrogen Embrittlement 475
Columbia Steel Co.—Rod and Wire Mill Operations 775
Conditions in the Pickling Bath which Effect Hydrogen Embrittlement by C. A. Zapffe and M. E. Haslem 753
Continuous Annealing of Soft Drawn Copper Wire by L. O. Walde 391
Control and Production of High Carbon Wire by J. G. Weiss 884
Controls for Speed and Tension ..... 673 & 763
Copper Wire Annealing 391
Copper Wire Drawing 589
Corrosion by Molten Materials—Parts I and II by F. R. Morral ..... 484 & 571
Corrosion Inhibitors in Theory and Practice by R. D. Misch and H. J. McDonald 221
Corronizing Processes 311

—D—

Dictionary—German Electrical Symbols 409
Dies—Diamond 777
Dies—Diamond Inspection 140
Dies—Laboratory For Testing 593
Disposal of Pickling Liquors by B. J. Queern 665
Drawing Copper Wire at Western Electric's Tonawanda Plant 589
Drives for Automatic Speed and Tension Control in Wire Processing Equipment—Parts I and II by N. J. Ranney ..... 676 & 763
Drives—Electrical 213
Drives—Electrical 676
Drives—Mechanical 763
Dumet Wire 138

—E—

Economic—The British Situation 420
Economic—Stainless Steel's Gain Since 1928 705
Economic—Steel Making Progress in 1947 171
Economic—Trend of the Wire Industry 42
Electrical Applications in the Wire Industry by J. G. Roby 213
Electrical Wire for Automobiles 34
Equipment Required for Sodium Hydride Process 39
Evaluation of Pickling Inhibitors from the Standpoint of Hydrogen Embrittlement. by C. A. Zapffe and M. E. Haslem
1—Acid Pickling of Stainless Steel 933
Part II—Acid Pickling of Carbon Steel 1048
Part III—Conditions of Cathode Pickling 1126

—F—

Fatigue Testing of Wire by F. A. Votta, Jr. 1117
Flexible Shaft and Casing Wire 33
Formation and Properties of Martensite on the Surface of Wire Rope by J. H. Corson 869
Forms—Wire 303
Forms Wire—Production Methods 305
Four Slide Machine 305
Fumes and Ventilation in the Wire Mill 895
The Fume Problem—Part I—Kinds of Fumes 312
Part II—Equipment for Controlling Fumes; A Scientific Approach to Fume Reduction and Elimination by W. G. Imhoff 399

—G—

Grand Crossing Tack Company—Interstate Iron & Steel Co.—Republic Steel Corp. by K. B. Lewis 147
Galvanizing Fumes 314
Government Wire Production Information ..... pps. 67-151-235-320-407 and 1144

—H—

Handling of Web and Monofilament Materials, The Parts I and II by C. A. Litzler ..... 1054 and 1131
Helical Compression Springs 481
High Carbon Flat Wire 33
History and Progress of Wire Coatings by H. L. Trembicki 762
Hot Dip Aluminum—Temperature and Methods of Applications by C. Ulshafer 1124
Hydrogen Embrittlement 475
Hydrogen Embrittlement in the Pickling Bath 753

—I—

Immersion Melting System of Protective Wire Coating 47
Industrial Diamond Association Letters 777-947-1056
Inhibitors—Classification of 224
Inhibitors—Corrosion 221
Inhibitors in Acid Pickling 759
Inspection and Maintenance of Diamond Wire Drawing Dies, The 140
Inspection——Steel Wire Mill 307
Interstate Iron and Steel Corp.—History 147

—J—

J&L Modernizes Wire Mill 580

—K—

Kintzing Wire Cloth Loom, The, by John S. Fitz 332

—L—

Langmuir Adsorption and Pitting 225
Labelling of Coils 347
Labor Relations by J. B. Stone 66-146-234-319-426-492-595-690-778-930-1077 and 1143
Lead Fumes 315
Looms—Wire Cloth 332

—M—

Machines—Wire Drawing General Types 213
Magnetic Materials—Japanese 153
Material Handling 45
Material Handling Trucks in the Wire Mill 968
Mechanical Spring Wire 32
Metallic Coating of Wire by H. Kenmore and F. L. Durr 135
Method For Measuring the Effect of Die Shape and the Use of Various Lubricants in Non-Ferrous Wire Drawing by C. B. Shopmyer 916
Modern Material Handling in a High Carbon Wire Mill by L. D. Seymour 45
Motors—Electric 213
Music Spring Wire 32

—N—

New Materials for Wire and Cable Applications by H. L. Wuerth 931
Nickel Alloys 173

—O—

Okoloy Coating Process 47
Outlook and Present Trend of the Wire Industry—
A Symposium by K. B. Lewis and J. L. Schueler..... 42
Outstanding Personalities of the Wire Industry
72-156-240-324-413-498-691-603-782-953-1059 and..... 1147

—P—

Packing of Wires 346
Patenting and Annealing Equipment (French) 808
Pickling Baths—Hydrofluoric Acid 314
Pickling Baths—Muriatic Acid 313
Pickling Baths—Nitric Acid 314
Pickling Brittleness 563
Pickling Liquors—Disposal of 665
Plant For Treating Waste Pickling Liquors 667
Portsmouth Steel Corporation by K. B. Lewis 227
Practical Application and Mill Practice with
Carbide Dies by E. T. Miller 910
Practical Development of Modern Wire Drawing
Compounds by E. L. H. Bastian..... 890
Progress Report on Experimental Development of
Surface Carbon Restoration in Decarburized
Coiled Rod and Wire Material by J. L. Kozma.... 680

—Q—

Quality, Quantity and Service by N. T. Nelson, Jr. 918

—R—

Relation Between Coldworking and Hydrogen
Embrittlement by C. A. Zapffe and M. E. Haslem 475
Republic Steel Corp.—History 147
Review of Recent Wire Patents—
76-162-247-330-418-504-607-698-787-964-1063 and..... 1152

—S—

Sensitivity of Different Steels to Pickling Brittleness
by C. A. Zapffe and M. E. Haslem 563
Sodium Hydride Cleaning for Non-Ferrous Metals 35
Speed Production of Protective Wire Coating Through
Immersion Melting System by C. W. Ange 47
Spiral Springs 587
Spring Design and Manufacture, Part I and II
by J. A. Roberts ..... 479 & 583
Spring Wire—Automobile Applications 31
Stabilization of Austentic Stainless Steel 512
Surface Carbon Restoration in Decarburized Coiled
Rod and Wire 680
Systems for Controlling Fumes 401

—T—

Testing and Bundling System—Single Unit 45
Testing Sodium Hydride in Descaling Bath 37
Thy-Mo-Trol Drive 217
Tire Wire 34
Torsion Springs 586

—U—

Upholstery Spring Wire 31

—V—

Valve Springs 482
Valve Spring Wire 31
Volute Springs 583
Views of Columbia Steel Company Plant 774

—W—

Wear Resistance of Wire for Wire Rope by R. S. Brown 1037
Western Electric Company Tonawanda Plant 589
Wire Association Elects Officers for 1948 406
Wire Association Program 942-946
Wire Association Proceedings (Of Convention
October, 1947), Technical Sessions 50
Wire Association—San Francisco Meeting 594
Wire Association—Worcester Meeting 493
Wire Drawing—Fine Wire 591
Wire Drawing—Intermediate 590
Wire Drawing Research in the British Iron and Steel
Research Association by W. C. Hessenberg 904
Wire Forms—Parts I and II by H. Chase..... 303 and 394
Wire in the Automobile by F. T. Updike 29

—Z—

Zinc Fumes 315

AUTHORS

Contributing the Leading Articles to WIRE AND WIRE PRODUCTS During the Year, 1948

ALEXANDER, H. L., Manager
Metal Descaling, Electro Chemicals Div.
E. I. DuPont de Nemours & Company, Inc.
Wilmington, Delaware.

ANGE, Charles W., Research Engineer
The Okonite Company
Passaic, N. J.

BASTIAN, E. L. H., Staff Engineer
Shell Oil Company
New York, N. Y.

BROWN, Reginald S., M. B. E., F I M,
Chief Metallurgist
Rylands Brothers, Ltd.
Warrington, England.

CHASE, Herbert, M. E.
Forest Hills, N. Y.

COATES, C., Chief Inspector
Frederick Smith & Company
Wire Manufacturers, Ltd.
Caledonia Works
Halifax, England.

CORSON, John, Research Engineer
John A. Roebling's Sons Company
Trenton, N. J.

DI GUILIO, Dr. Armand, Consulting Chemical and Metallurgical Engineer
Detroit, Mich.

DURR, Frank L.
Kenmore Metals Company
New York, N. Y.

HASLEM, M. E., Research Chemist
Laboratory of C. A. Zapffe
Baltimore, Md.

HESSENBERG, W., Head of Mechanical Working Div.
British Iron & Steel Research Association
London W. I., England

IMHOFF, Wallace G., President
The Wallace G. Imhoff Company
Los Angeles, California.

KENMORE, Herbert
Kenmore Metals Company
New York, N. Y.

KOZMA, J. L., Engineer
Lee Wilson Engineering Company
Cleveland, Ohio.

LEVERIDGE, Athos D., Executive Manager
Industrial Diamond Assn. of America
New York, N. Y.

LEWIS, Kenneth B.,
Consulting Wire Mill Engineer
Worcester, Mass.

LITZLER, C. A., President
Industrial Ovens, Inc.
Cleveland, Ohio.

McDONALD, Hugh
Illinois Institute of Technology
Chicago, Illinois

MILLER, E. T., Die Service Engineer
Firth Sterling Steel & Carbide Corp.
McKeesport, Penna.

MISCH, Robert D.
Illinois Institute of Technology
Chicago, Illinois.

MORRAL, Prof. F. R.
Syracuse University
Syracuse, N. Y.

NELSON, N. T., Jr., Rod & Wire Mills
Bethlehem Steel Company
Sparrows Point, Md.

QUEERN, Brun J., Chemical Engineer
The Dorr Company
New York, N. Y.

RANNEY, N. J., Chief Engineer
Wean Equipment Corp.
Cleveland, Ohio.

ROBERTS, John A., Research Engineer
Herbert Terry & Sons, Ltd.
Reddich, England.

ROBY, J. G., Machinery Division
Industrial Engineering Division
General Electric Company
Schenectady, N. Y.

SCHUELER, Julian L., General Superintendent
Continental Steel Corp.
Kokomo, Indiana.

SEYMOUR, LeRoy D., Manufacturing Manager
Wire Mills Division
John A. Roebling's Sons Company
Roebling, N. J.

SHOPMYER, C. B., Apparatus Department
General Electric Company
Schenectady, N. Y.

SMITH, Kenneth, President
California Redwood Association
San Francisco, California.

STONE, J. B.
Washington Correspondent
Washington, D. C.

TREMBICKI, H. L., Manager
Metal Coating Division
Magnus Chemical Company
Garwood, N. J.

ULSHAFER, Clarence, Metallurgist
Hughesville Machine & Tool Company
Hughesville, Penna.

UPDIKE, F. Titus, Chief Products Engineer
Product Engineering Dept.
Round and Cold Rolled Products Division
John A. Roebling's Sons Company
Trenton, N. J.

VOTTA, F. A., Jr.
Hunter Spring Company
Lansdale, Penna.

WALDE, Leonard A.
Collyer Insulated Wire Company
Pawtucket, R. I.

WEISS, Jerry G., Superintendent
Patent and High Carbon Wire Dept.
Keystone Steel & Wire Company
Peoria, Illinois.

WITTEVELD, Chris
Bridgeport Brass Company
Bridgeport, Conn.

WUERTH, H. L., Geon Division
B. F. Goodrich Chemical Company
Cleveland, Ohio.

ZAPFFE, Dr. C. A., Consulting Metallurgist
Baltimore, Md.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

WATSON

ELECTRICAL WIRE AND CABLE, WIRE ROPE AND CORDAGE MACHINERY

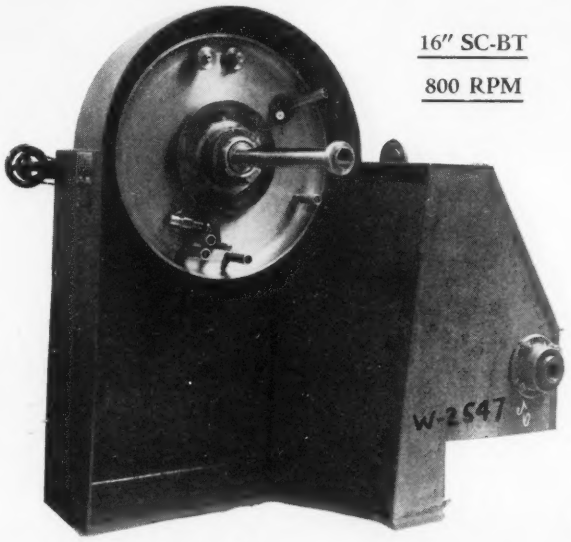
TAPING HEADS-Type "SC-BT"

RE-22,024
U. S. PATENT

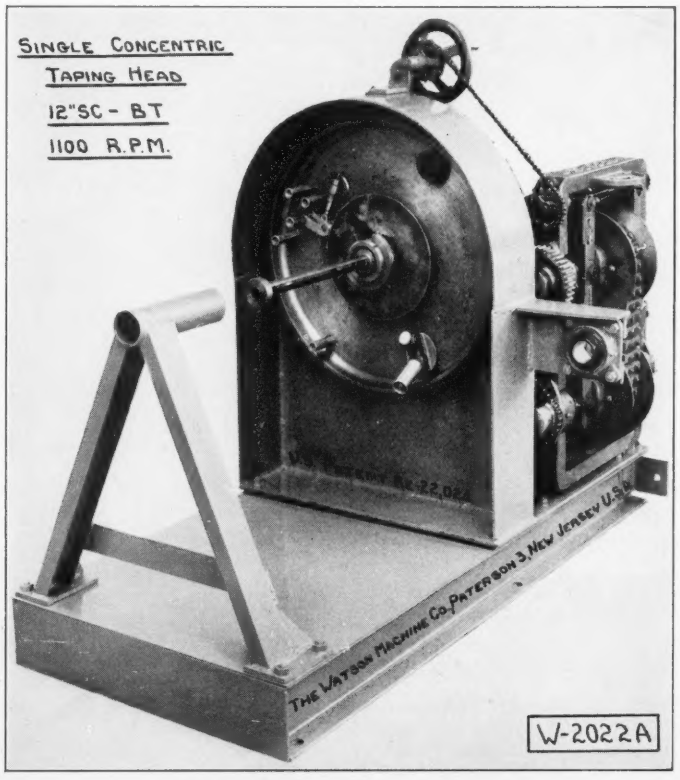
The high speeds made possible by this design make these heads the IDEAL TAPE APPLIERS in line with cabling, stranding and insulating machines where the taping operation normally governs the machine output.

Outstanding advantages are uniform tape tensions, ease of adjustment and control.

All steel, ball and roller bearing construction. Dynamically balanced rotor assembly insures vibration-free quiet operation.



16" SC-BT
800 RPM



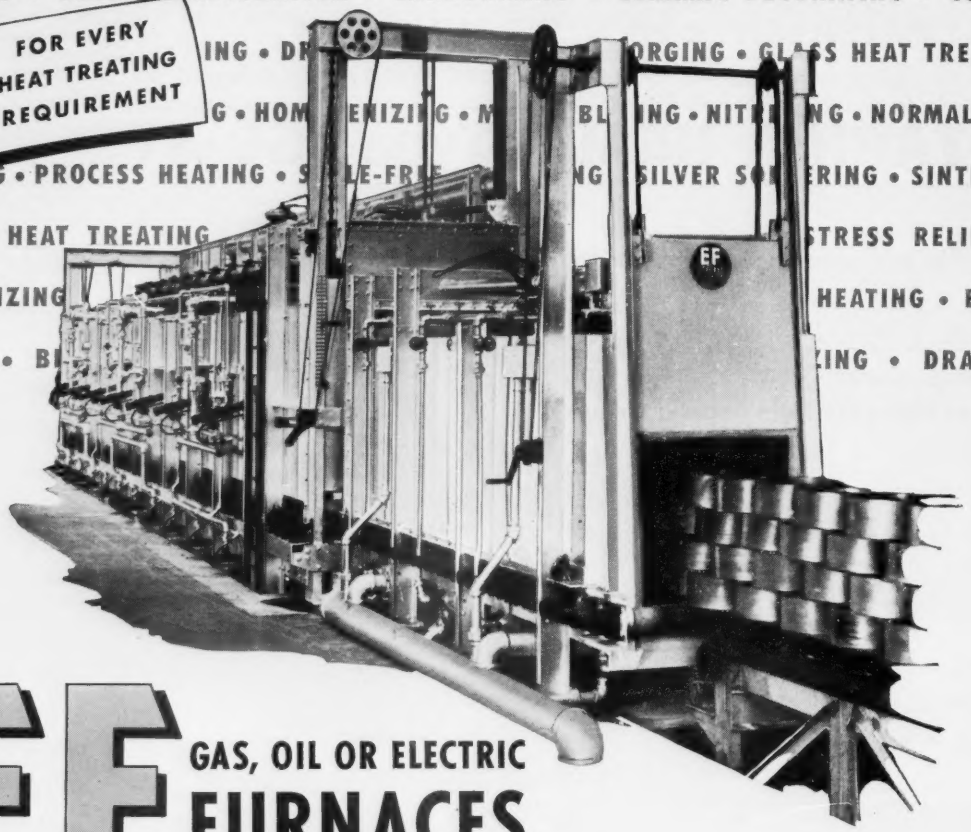
Available in various sizes, either as Single Heads shown here — or — in multiples on single base and in complete taping machines with main motor drive, capstan and takeup.

REQUEST MACHINERY
BULLETIN 060148

Also available are eccentric designs and various designs for metallic tape application

AGEING • ALUMINUM BRAZING • ANNEALING • BILLET HEATING • BRASS BRAZING • BRIGHT ANNEALING • CARBON RESTORATION • CARBURIZING • CERAMIC DECORATING • COPPER BRAZI… ING • DI… ORGING • GL…SS HEAT TREATING GLASS … G • HOM… ENIZI…G • M… BL…NG • NITR…NG • NORMALIZING PATENTING • PROCESS HEATING • S…LE-FR… …NG SILVER SO…ERING • SINTERING SOLUTION HEAT TREATING …STRESS RELIEVING SPHEROIDIZING … HEATING • BRASS BRAZING • BI… …ING • DRAWING

FOR EVERY HEAT TREATING REQUIREMENT



EF GAS, OIL OR ELECTRIC FURNACES

● For the utmost in efficient, dependable, low cost service specify an EF gas, oil or electric heat treating furnace. Engineered and built specially for your particular and individual need, an EF furnace assures the smooth, continuous flow of material through the heat treating processes, and reflects throughout the advantage of many service-proved features conceived and perfected by EF engineers, and available only in EF design. These include the EF radiant tube and EF heat exchanger which combine to assure extremely high combustion efficiency; the EF cast alloy electric heating elements; EF roller design and mounting that minimize servicing and maintenance; EF special atmosphere generators, and many other devices that assure uniform temperature throughout the furnace, accurate control of heat within the required limits, low maintenance, high hourly outputs and uniform, low cost, dependable operation.

Let EF Engineers, with their long experience in all phases of furnace operation, work with you on your next heat treating job!

EF

THE ELECTRIC FURNACE CO.

WILSON ST. AT PENNA. R.R.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem-Ohio